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The Pedespeed.

Mercury, the messenger of the gods in ancient mythology, had winged feet. Some three thousand years hence, some antiquarian digging for relics among the ruins of American cities, will discover that the Yankee Mercury had his feet furnished with wheels, and that he probably made faster time than the Greek Mercury by odds.

A few mornings since a quiet gentleman and a handsome youth walked into our sanctum, bringing with them a queer looking package. The queer looking package was no matter of surprise to us, for our eyes are familiar with nearly all the forms into which the genius of inventors can torture wood and metal. But while the elder of the two gentlemen entered into conversation with us the younger undid the package, disclosing a pair of wheels some fourteen or fifteen inches in diameter, to which were attached some stout hickory stirrup-like appendages, in the bottoms of which were foot pieces, shaped like the woods of common skates.

On one side of the stirrup-like appendages were firmly fastened metallic plates, each having a short axle or bearing projecting from its center, upon which the wheels above mentioned turned. The stirrup-like appendages were made of flat strips of wood about three inches wide in the broadest portion, bent so that one side was nearly straight, while the other was made to meet it about midway to form a sort of loop. In the bottom of this loop were placed the foot-pieces above described, provided with toe straps and a clasp for the heel. To the upper end of the stirrups was attached a piece of wood to fit the outer and upper conformation of the calves of the legs.

In less time than it took us to note these points, the young gentleman—who was subsequently introduced to us as the son of the inventor of this singular device—had strapped on the wheels and commenced rapidly gliding about among chairs and tables with singular swiftness and gracefulness. A space being cleared he proceeded to execute with seemingly perfect ease, the inside and outside roll, figure of eight, etc., etc., amply demonstrating that the "pedespeed" has all the capabilities of the skate, both in the variety and grace of the evolutions that can be performed with it.

THOMAS L. LUDERS' PEDESPEED.

Our engraving gives an excellent representation of this invention. Of course no mere carpet knight accustomed to roll about on the common parlor skate, can use these at the first attempt. They require practice; but when skill is once attained, there is skating the year round. Had the pedespeed been introduced on our rinks this winter during the long period stockholders have prayed in vain for ice, their stock would have stood higher in the market than it does at present.

The pedespeed is light and strong, and is capable of use on surfaces where the ordinary parlor skate would be useless The inventor, a large and heavy man, informs us he can use it constantly for two hours without fatigue. For gymnasiums, colleges, and parts of the country where no ice ever occurs, it affords a delightful, healthful, and graceful pastime at all seasons of the year.

When used by ladies, shields may be employed to cover the top of the wheels so as to protect the dress.

Thomas L. Luders, Olney, Ill., is the designer of this new appliance for locomotion, and of him further information may be had.

Improved Fan Blower.

The fan blower has held a position as a standard machine for about forty years, the first having been built by Ericsson & Braithwaite, in 1829.

The high speed at which it has to be driven, and the consequent great consumption of power and excessive wear and tear, have justly been considered serious objections to it. Notwithstanding the many attempts made to overcome these defects they still exist.

Clark's "Multiplying-Pressure Fan Blower," illustrated in the accompanying engravings, attains the desired end. It gives the requisite pressure without high speed, and yet has all the simplicity of the ordinary fan blower.

The illustrations represent two forms of the blower, and also a longitudinal sectional view, enlarged, of one of the bearings, and the adjustable device connected therewith. The same letters refer to similar parts in all the cuts. Fig. 1 shows one of these blowers that multiplies the force of the blast four times. Fig. 2 shows one that doubles the force of the blast with the same speed required by an ordinary blower of the same diameter of fan. Fig. 3 is an enlarged view of the bearings with an improved mode of adjustment.

The blower is made in compartments, each of which is formed exactly like the others. In fact each compartment is a well-constructed fan blower, receiving the air at the center and delivering it at the circumference, where it is forced over the edge of the disk, C, through the annulus between the disk, C, and the shell or case, A, in the direction of the arrows, and thence down between the disk, C, and the opposite side of the shell, A, to the center of the next fan, by which it is received and delivered exactly as in the first, and so on through the whole series, whether the number be four or more.

The passages leading from one compartment to the next may seem tortuous and difficult for the passage of the air, but they are made in all cases eight times greater in area than would be required to deliver the air under pressure at the point of final delivery, and as the resistance to the flow of aeriform fluids diminishes in the ratio of the square root of their velocity, the loss from that source being only one sixty-fourth, becomes insignificant.

Fig. 2, which only doubles the force of the blast, consists of two of the above described sections—one at each end delivering the air into the center of a fan that is common to both. This form makes a cheaper blower than Fig. 1, and answers well for many purposes where a very high pressure is not required; such as small forges, steam boilers, puddling and heating furnaces, and melting holes for cast steel. For cupola furnaces, where great pressure of blast is so essential, Fig. 1 is decidedly preferable.

Fig. 3 shows a device by which the shaft may be moved lengthwise, so that in the event of the fans in either compartment touching the side of the shell they may be easily adjusted. The journal box (Fig. 3) is a hollow tube lined with Babbitt metal; a plano-convex ring fits over this tube; this ring is cut in the line of its axis, so that by compression it may he made to gripe the journal box. A hub, so formed as to receive one half the plano-convex ring, is held in the center of the central opening by the three arms, as shown. Another hub, made to fit the other half of the plano-convex ring, is secured to the first one by bolts. When the bolts are slack the journal box may be moved endwise, but when they are tight it is held firmly in place.

We have seen this blower tested, and can assure our readers that it accomplishes what its inventor claims for it; we have seen it with a pressure gage on each compartment, and invariably the gage on the fourth one indicated a pressure four times greater than that on the first. We have been shown very flattering testimonials from some of the best founderymen and machinists in the country, respecting this blower. It is no longer an experiment.

Fig. 1.

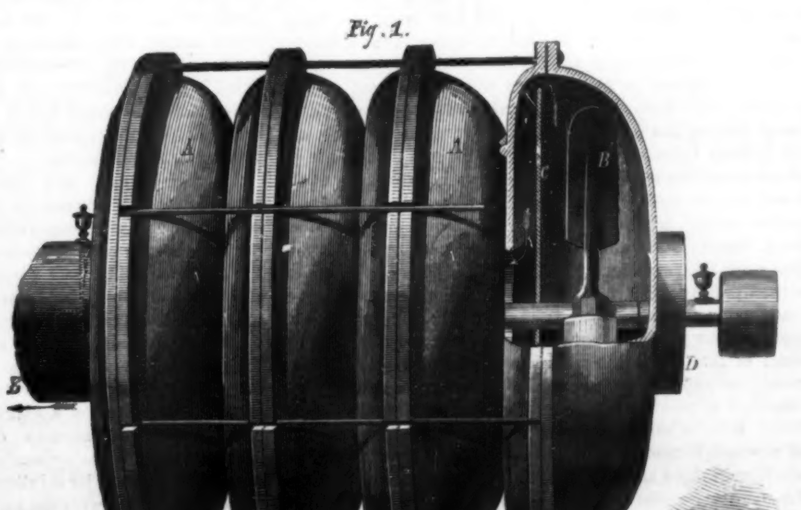
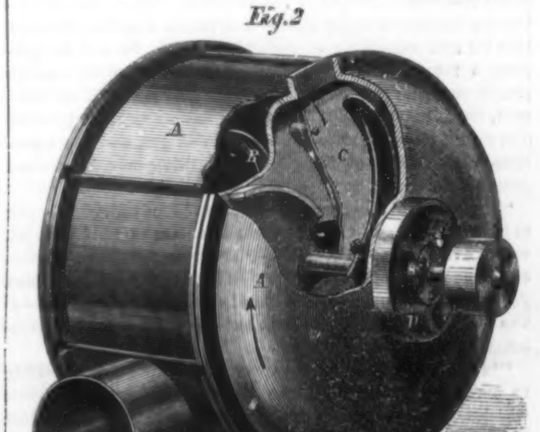


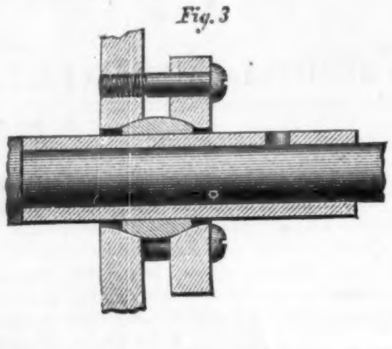
Fig. 2



CLARK'S MULTIPLYING-PRESSURE FAN BLOWER.

This invention, which we regard as one of much interest, both in a scientific and practical point of view, is covered by two patents, dated, respectively, Oct. 23, 1866, and Dec. 22, 1868. A patent has also been secured in England through the Scientific American Patent Agency. The inventor, Patrick Clark, of Rahway, N. J., is well known in the field of mechanical invention.

Fig. 3



A company has been formed for the manufacture of these blowers, under the name of the "Rahway Manufacturing Co.," at Rahway, N. J., to whom all inquiries should be addressed.

VISIT TO A STEEL MANUFACTORY.

A writer in the *Atlantic Monthly* for March gives a very graphic account of the manufacture of steel by the Bessemer process, which we copy.

"Our entire party thronged the building, some passing directly to the floor of the casting house, while others mounted the high platform of the cupola furnaces, to see the beginning of the famous 'Bessemer process,' used in the manufacture of steel at this establishment. For me, who knew nothing of steel-making except by the old-fashioned, roundabout methods, this new 'short-cut,' as it is fitly termed, possessed a surprising interest. Laborers were casting into one of the furnaces barrow-loads of coal and pig, each fragment of which had been carefully examined, for not every quality of iron and anthracite can be used in this process. The molten metal was run off into a huge bucket, weighed (for precision as to proportions is also necessary), and finally poured like some terrible, fiery beverage, a soup of liquid iron, into the stomach of a monster with an egg-shaped body, and a short, curved, open neck, resembling some gigantic plucked and decapitated bird. In place of wings a pair of stout iron trunnions projected from its sides. Upon these it was so hung that it could be set upright or turned down on its belly. It was down, receiving its pottage, when we first saw it. Presently it was full-fed—five tuns of molten iron having been complacently swallowed. Then, moved by an invisible power, the creature, slowly turning on its wings, sat, or rather hung, upright. 'Now they are going to blow,' said our guide.

"In the casting-room below, immediately beneath the monster, was a semicircular pit, round the side of which was ranged a row of smaller iron vessels, reminding me of Ali Baba's oil jars, each capable of containing a bandit. Or, if we regard the large bird as a goose, these may be called goslings. They were all sitting on the bottom of the pit, with expectant mouths in the air, waiting to be fed. But the mother's food was to undergo a remarkable change before it could become fit nutriment for them. Iron ore, besides containing silicium, sulphur, and other earthy impurities, is combined with a large proportion of oxygen. The smelting furnace burns out the oxygen, and removes a portion of the impurities, but only to replace them with another interloper—carbon, absorbed from the coal. Cast iron contains from four to five per cent of carbon; steel, only about one quarter as much, or even less, according to its quality. To refine the crude cast iron, eliminating the excess of carbon, and yet retaining enough to make steel—or to reduce it first to wrought iron (or iron containing no carbon), and then to add the proportion required for the tougher and harder metal—seems simple enough; yet the various processes by which civilized men, from the time of Tubal Cain, have aimed to produce this result, have hitherto been slow, laborious, and expensive. Bessemer's method of doing this very thing on a simple and grand scale was what we were now to witness.

"The moment the monster was turned upright he began to roar terribly, and to spout flame in a dazzling volcanic jet, which even by daylight cast its glare upon the upturned faces of the spectators grouped about the floor of the casting-house. As we had seen only molten metal enter the 'converter'—so the huge iron bird is called—the appearance of such furious combustion was not a little astonishing.

"'In the bottom of the converter,' said our guide, shouting to make himself heard above the roar, 'there are tweers which admit a cold blast of sufficient force to blow the molten iron all into spray. This brings the oxygen of the air into contact with every minute drop of the metal, and what took place in the smelting-furnace is reversed; there the carbon helped to burn out the oxygen of the ore, now the oxygen comes to burn out the carbon.'

"'But what,' we shouted back, 'prevents the oxygen from playing the same trick the carbon played before?'

"'That is just what it will do if the blast is continued too long—the iron will oxidize again. But the oxygen has a stronger affinity for the carbon and other impurities than it has for the iron, and doesn't begin on that till those are burned out.'

"'I see: you shut off the blast at a moment when just enough carbon remains to make steel.'

"'Not exactly, though that is what Bessemer spent a great deal of time and money trying to do. But he found it impossible always to determine the time when the blast should be stopped, and often too much or too little carbon left in would spoil the product. So he changed his tactics. You will notice that we first burn out all the carbon; that is done in about fifteen minutes. You see that man in green glasses, on the little platform over in the corner, watching the flame from the converter? The instant he sees it lose its dazzling colors and become pale, and decrease, he knows the last of the carbon is burning, and the blast is shut off.'

"Meanwhile it seemed very wonderful that molten metal should contain fluid enough to make so furious a fire; nor was our astonishment diminished when we were told that the cold-air blast actually raised the temperature of the mass from 3,000° to 5,000° Fahrenheit during the brief process.

The blast shut off, the converter was turned down on its belly again, in order to prevent the metal from running into the tweers, now that the pressure was removed. 'The iron,' said our guide, 'is left by the blast decarbonized, and in a slight degree reoxidized. It also contains a little sulphur, after all its doctoring. Now we add a certain quantity of pig iron of a peculiar quality—either Franklinite or Spiegeleisen will do—containing a known percentum of carbon and manganese.' The dose was poured into the monster's throat, and a violent commotion in his stomach ensued, accompanied by a copious outpouring of smoke and flame. After a minute or two all was quiet. The new ingredients had burned out the oxygen and sulphur from the mass—just enough of the freshly introduced carbon remaining unconsumed to take up its permanent lodging in the metal and make steel.

"The contents of the converter were now poured into a huge ladle swung up under it by the long arm of a crane worked by invisible power, and afterwards discharged into the open mouths of the smaller monsters in the pit. These were, of course, merely molds; and into each was cast an ingot of steel weighing some six hundred pounds. The metal was discharged from the bottom of the ladle, and thus kept separate from the slag, which floated on its surface and was retained until the last. In twenty-five minutes from the time we entered the building we had seen five tuns of pig iron 'converted,' and cast into six hundred-pound ingots of steel.

"Having given one glance at Bessemer's method of lining his ladles and converters, to enable them to resist the intense heat of the charge, and another at the hydraulic machinery by means of which a lad on the little platform in the corner could rotate the converter, and lift ladles and ingots, doing the work of fifty men, we passed on to the rolling mill, where each ingot is heated and hammered (the enormous steam hammer coming down upon it with a resounding thump), then reheated, and rolled out into a rail, to be sawed off red hot at the right length (twenty-five feet) by a pair of shrill circular saws that do their work neatly and swiftly, as if the steel were soft pine, and the pyrotechnic spark-showers thrown out mere sawdust. Lastly, we saw the strength of a rail tested under repeated blows from a V-shaped tun-weight of iron dropped upon it from a hight of eighteen feet; and came away inspired with a high respect for Bessemer, both as an inventor and a public benefactor."

Soft Solder Silver Plating.

The art of plating metal upon metal, or, so to speak, metallic veneering, is very widely practiced, and is of great utility, both in the industrial and ornamental arts. The variety of metals capable of being plated on to the surface of other metals is very great, and the methods of applying them differ accordingly. Silver is the most universally applied metal in plating, and I propose to give a short, practical account of two of the least known methods of silver plating.

The four principal methods of silver plating, placed in the order of their cost and durability, the first being the cheapest and least durable, are (1) electro plating, (2) rolled-metal plating, (3) close plating, and (4) hard solder plating.

Electro plating is generally so well understood, that it would be superfluous to enter into that subject here. Rolled metal plating can be dismissed in a few words, it being simply brazing together a thin ingot of silver and a thick ingot of the metal desired to be plated, and rolling them out in the usual way of rolling sheet metals. Close plating, or soft solder plating, is an art which is very little known or understood beyond the trade itself and its immediate connections. The work is of such nicety, and requires such a high degree of manipulative skill, that not more than four out of every ten who are apprenticed to it make thoroughly good workmen. Silver plating is not an unhealthy occupation, although until of late years the workmen were not remarkable for steadiness and sobriety; several attempts have been made to establish a provident society among them without success, but it is to be hoped that this will soon cease to be a matter of reproach to them. The principal seats of the plating trade are Birmingham and Walsall, the operative silver platers in London not numbering more than fifty. The tools required are few and inexpensive, and the workshop space limited in extent, but the materials, of course, are very expensive.

The articles plated by the soft and hard solder processes are now confined mainly to coach and harness furniture. Cutlery and spoons were plated by these processes formerly, but the introduction of electro plating took that part of the solder plater's trade almost entirely away.

The article intended to be "soft" plated, termed the rough, is first prepared from the forging or casting (as the case may be) by means of files of successive degrees of fineness, which produce a smooth surface. It is next "tinned" by being immersed for a short time in a solution of sal ammoniac in water, or diluted muriate of zinc, and then dipped into a melted amalgam of tin and lead, taken out, and smartly shaken, a little finely powdered sal ammoniac being sprinkled over it the while, which "flushes" the tin, and causes it to have an equal thickness all over the article, which is next dipped as suddenly as possible into clear cold water. This completes the tinning process, and it is now ready for the silver.

The silver used is usually in the form of sheets 4in. or 5in. wide, and of an indefinite length, which, being very thin, cannot be measured by mechanical gages; the thickness is, therefore, determined by the length per ounce, assuming the sheet to be 4in. wide; so that a piece of sheet silver, 18in. long by 4in. wide, and weighing 1oz., is No. 18 gage.

This is cut out with scissors to the proper size and shape, and "stuck" to the article, by passing a well-tinned heated copper bit over it with a slight pressure; the heat passing through the silver, melts the tin, and thus causes it to "stick." It is then hammered with a leaden hammer, clothed with kersey or woolen cloth, called a madge, which lays it closer to the article, and next skillfully worked into the crevices of the work, great care being required in this stage to avoid cracking or splitting the silver; when it is sufficiently worked down, the heated copper bit is rubbed closely and evenly all over the parts of the work that the silver is applied to. This finishes what is called the "getting on," that is, supposing the work to be one-sided, or plated on the front only; but if it is required to be plated all over, this operation has to be repeated on the back, and the two edges of silver neatly brought together, forming what is termed a joint. This "all-over" work is only intrusted to the best workmen, it being much more difficult than the "one-sided."

The next process is "soldering," and is effected by the work being held over a clear coke fire, and plentifully sprinkled at intervals with powdered black resin, first removing it from the fire for that purpose. As soon as it is sufficiently hot to cause the resin to ignite, it is rubbed with a cotton rag, saturated with oil, care being taken to rub from the lighter toward the heavier portions of the article; this rubbing is continued, with gradually increasing pressure, until the article is sufficiently cool for the substratum of tin below the silver to solidify. The effect of the soldering is to equalize the thickness of the tin, and to expel the air, thus insuring the "soundness" of the work.

We now come to the "rubbing," which is a sort of burnishing with a rough burnisher, called a rub; the tool offers rather a singular illustration of wearing out giving value to an article, a rub being simply a half-round, smooth file worn down so much as to be useless for filing, which, if worn equally in all parts, and not nicked on the edges, is worth three or four shillings, the original cost being sevenpence. The use of the rub is to smooth and harden the silver. The work is next "dressed" by rubbing with leather thinly spread with pumice powder moistened with oil, which removes the coating of tin left on the outside surface of the silver by the "getting on" and "soldering" processes, and, at the same time, smooths the surface, and prepares it for the final polishing with leather, slightly dusted with powdered rottenstone.—*English Mechanic.*

Nickel Plating.

The following is from some remarks made by M. Dumas upon this subject before the French Academy of Sciences.

"In the numerous experiments attempted heretofore by M. Becquerel, Sr., M. de Kurlz, and others, they have succeeded in depositing upon objects a coating of nickel, but the means of which they made use had not the certainty and regularity necessary to an application really practical, which qualities are particularly marked in the method of Dr. Isaac Adams, of Boston.

"The Academy will notice with interest several of the results obtained by Mr. Adams. The coating of nickel is very uniform. It adheres perfectly. It is susceptible of any desirable thickness. It has a remarkably brilliant polish, which is very easily obtained. When the article comes from the bath it is only necessary to rub it with a cloth impregnated with a little metallic powder to give it all its luster. This electro-deposit of nickel can be well used for covering articles of saddlery, cutlery, plumbing, clockmaking, tools, fire-arms, decoration, etc.

"It may be used, and this is a valuable application, for covering plates designed for reprinting engravings; and on account of the very slight abrasion of the nickel covering, a perfect drawing can be repeatedly procured.

"Nickel is white, and possesses the property of resisting the action of the air, acids, and any substance with which it may come accidentally in contact. Its hardness is superior to that of untempered steel, and its cost is little. So much for the useful and industrial side of the question. From a scientific point of view, continues M. Dumas, the researches of Mr. Adams are of a nature to throw great light upon many of the phenomena displayed by electro deposits. When one wishes to separate the oxide of nickel by a fixed alkali from one of its solutions, there remains either potash or soda combined with the nickel, and nickelate of potash is formed accidentally. It is precisely this difficulty of obtaining the oxides and the carbonates of nickel free from potash or soda, which has defeated, until now, other experimenters.

"The discovery of Mr. Adams consists above all in having observed that when a solution of nickel contains the slightest traces of potash, magnesia, etc., the metal, instead of being deposited pure, will be found mixed with little particles of peroxide of nickel, which take from the adherent plating all its cohesion and its beauty. Further, the American chemist employs nickel salts entirely free from a fixed alkaline substance, such as the double sulphate of nickel and ammonia, or the double chlorate of nickel and ammonia. From this moment the operation is made with the greatest ease. The salt is decomposed in the bath, the nickel is de-

posited on the object placed at the negative pole, and the solution keeps neutral.

"The invention or discovery is no longer under trial. It has been shown to be practicable, and we may say that the new process belongs henceforth to the arts. It is a new and excellent victory, which it is permitted to us to chronicle."

AN INTERESTING REVIEW OF THE AMERICAN PATENT SYSTEM.

BY GENERAL SAMUEL A. DUNCAN.

The fourth of the Lowell Institute lectures, under the auspices of the American Social Science Association, was delivered on the 4th inst., by Gen. Samuel A. Duncan. He said: The wonderful progress in the arts and sciences during the last four centuries, especially during the last hundred years, is the combined result of various influences. The invention of the art of printing, by multiplying and cheapening the means of knowledge, and placing within the reach of every seeker after truth the accumulated experience and wisdom of the race, stimulated the mind into unwonted activity. The development of the laws of steam, and their practical application to the purposes of locomotion, and in all the industrial pursuits of life, has made that wonderful mechanism, the steam engine, one of the most potent instrumentalities in molding the civil, the social, and the political institutions of the world. The Reformation, too, operated to release the human mind from the galling bondage under which it groaned; when its fetters were broken, then came freedom of thought and liberty of conscience and a larger spirit of inquiry. But, all other reasons aside, the changed condition of affairs is largely the result of the liberal encouragement which enlightened governments have extended to persons who have been the discoverers and introducers of new and useful inventions. Recognizing the great and lasting benefits that naturally accrue to the State from the creation within its limits of a new branch of industry, or the introduction of any improvement in trade or manufactures, the legislation of every country in Christendom, with a solitary exception, has provided a system of patents with a view to encouraging the spirit of invention. When our own Government was founded this source of national prosperity was not overlooked. Wisely judged the wise men who framed the fundamental law of the Republic, when they incorporated therein a provision conferring authority upon the National Legislature "to promote the progress of science and the useful arts by securing, for limited times, to authors and inventors the exclusive right to their respective writings and discoveries."

Conformably with the power conferred by the Constitution, Congress has placed upon the statute book various laws, designed to secure the contemplated protection to inventors. The first law relating to patents for inventions was passed by the 1st Congress in 1790. This was repealed in the act of 1793; and this, again, with subsequent amendments, was superseded by the legislation of 1836. The act approved July 4th of that year, entitled "An act to promote the progress of the useful arts," as variously amended and supplemented, forms the basis of our present system of patents.

Much has been said about the inherent natural right of property in the products of one's brain, and it is upon this ground that frequent attempts are made to justify the granting of patents. Wherever thought and time and ingenuity have been expended, and valuable results produced, the full benefits thereof, it is argued, should accrue to him whose brain and hands have done the work—just as the capitalist possesses full control over his stock dividends and the interest upon his bonds, the farmer over the products of his land, or the laborer over his hard-earned daily wages. It is doubted whether this be the correct theory. Man undoubtedly has a natural right over everything of his own creation, and which at the same time he has the power to monopolize; but only to the extent and so long as he can monopolize it. When it goes beyond that, and the individual calls upon the State to interpose its strong arm for his protection, the State responds only when in its judgment it is for the interest of the whole to do it. In things material, as houses, and lands, and beasts of burden, the world is agreed that society derives advantage from their exclusive ownership by individuals. They are capable of individual appropriation; and hence the State recognizes and protects the right of property therein. But ideas are incapable of appropriation. So long as an idea remains in the breast of him with whom it originated, it is his, because he can control it; when once it is communicated, it is beyond his control forever. Driven from a material possession, a man may recover it by physical force; but recovery of exclusive possession of an idea which has once passed to others, is beyond human power. If there be a natural right of property in ideas, so as to control, not simply the idea itself while it remains a secret, but all the various embodiments of it by which it has become disclosed, why shall not that right be held in perpetuity? But against such a proposition the sense of the whole world revolts. If its adoption were possible, it would check progress forever.

In the case of a given application for a patent, it being primarily decided that there is invention displayed, the questions then to be determined are: Is it new with the applicant, and is it useful? To decide these questions properly is a work of labor and extensive research. It involves an examination of the entire body of American patents, now numbering more than 100,000, a large mass of rejected applications, the patents of foreign countries, numerous text-books, encyclopedias, reports of scientific associations, and a long list of rapidly multiplying scientific and technical journals. Many legal questions are also involved which require an acquaintance with the entire body of judicial decisions in this branch of jurisprudence.

The question of novelty is usually found to be the most difficult one, because of the labor required in ascertaining the facts upon which it is to be settled. The question of utility divides into three branches: 1. Is the machine or process operative—i. e., theoretically? 2. Is it trivial or frivolous? 3. Is it pernicious? How these various questions are practically managed may, perhaps, best be illustrated by a few examples. For instance: An application was recently filed for alleged improvement in the mode of propelling vessels. A screw is projected into the water from the prow of the vessel, and the shaft, running back, gears with a transverse shaft carrying paddle-wheels; masts are provided and sails erected; the wind gives motion to the vessel; this puts the screw in revolution, and the screw of course the wheels; the action of the wheels, added to that of the wind, impels the craft with increasing velocity; and so the work goes on, the screw giving power to the wheels and the wheels to the screw—until, carrying the invention to its logical conclusion, the vessel must either take fire from excessive friction, as she dashes onward in her maddened career, or bring up against some unlucky continent with a shock sufficient to discharge cargo and passengers at any point in the interior without the delay attending the ordinary mode of discharging freight. His application was properly rejected. "Perpetual motions" have never yet succeeded.

As regards inventions of a mischievous tendency, a notable case came before the officer under the administration of the Hon. Joseph Holt. The applicant sought a patent for a "policeman's club," so constructed that upon releasing a spring, a triple row of keen-edged lancets would leap from the hidden recesses and mangle the hand of an adversary. Applicant's professed object was to provide policemen with ample means of protection and yet obviate the necessity of arming them with deadly weapons—so objectionable because so often used with fatal effect in the heat and danger of personal encounter. The Commissioner refused the patent on the ground that while the safety of the conservatory of the public peace in their conflicts with lawless men was a laudable object, and might be secured by the new implement, yet, if transformed to a weapon of defense in the hands of desperadoes, as it inevitably would be, it would be an evil.

Among the many thousand applications received yearly, it is to be expected that many singular inventions will be found. Besides the cases already named, reference might be made to a patent granted years ago for a mode of removing worms from the human system without medicine. A small cylinder filled with a tempting bait, and having a string attached to it, is swallowed by the sufferer. The worm, if he kindly consents to carry on his part of the programme, thrusts his head into the trap, and disturbs a spring which is armed with a set of teeth, and which, on being released, darts forward to seize the intruder by the throat, when worm and trap are withdrawn together. The description suggests a strict course of preliminary dieting for the patient, and actually recommends in obstinate cases, in order to insure complete success, that he be kept without nourishment for five and six, or even seven days.

A few statistics as to the current business of the Patent Office may not be uninteresting. The whole number of patents issued up to date is 100,486, while about 50,000 cases have been rejected. In 1869 the applications numbered 19,271, and the patents issued 13,986. Of these 15,442 were to citizens of the United States, and 544 to citizens of 27 different foreign countries. To put these patents into print there is constantly employed at the Government Printing-Office a force of 17 compositors. The patents to American citizens were distributed in part as follows: To New England about 20 per cent, Massachusetts having as her share 10 per cent and Connecticut 5½ per cent; to the Middle States, 36 per cent, New York alone receiving 23 per cent; to Ohio and Illinois 7 per cent each; to California 2 per cent; and to the 11 States that engaged in the Rebellion, but 4½ per cent. Before the war these States had never received a larger proportion of the patents granted than 7½ per cent. The figures show that New-England receives the largest proportion of patents according to her population.

The expenses of the Patent Office up to the present time have been $5,583,237·35, to which, if be added the cost of the building itself, and the money expended upon the annual reports, the entire sum will reach perhaps $12,000,000. But what is this compared to the benefit derived by the public from a single invention of real importance. There are, perhaps, 400,000 sewing-machines in use in the country. Ten cents a day would seem an absurdly low estimate of the value of each of these to its owner; and yet even this daily profit would make the aggregate annual sum to the community from this source alone $15,000,000. It is computed that the saving of grain by the use of thrashing machines in place of the flail which they have supplanted is 10,000,000 bushels annually.

The distinctive feature of the American system as compared with the European is the official inquiry instituted into the character of the invention as regards its alleged novelty and utility. In Europe patents are usually granted upon simple registration. Two or three countries only provide for a preliminary examination; but this is conducted upon such illiberal principles as to amount almost to prohibition. In Prussia, for instance, in 1867, only 103 patents were issued, while in the United States the number reached 13,000. The patent of registration carries with it no presumption of validity.

The recent outcry in England against patents is based largely upon the amount and excessive cost of litigation in this class of causes. The great majority of American patents are beyond doubt good and valid, and by consequence patent property possesses a commercial value in this country that attaches to it nowhere else. And this too, has contributed largely to induce the liberal policy displayed by our courts in dealing with patent questions; since, in marked contrast to the English practice, they have generally aimed, in accordance with the maxim of interpretation, *ut res magis valeat quam pereat*, to sustain the patent, if not plainly in violation of principle.

In the Netherlands abolition has actually been voted by large majorities in both Chambers of the Legislature. Switzerland never had a law on the subject. And in December, 1868, Count Bismarck, in a message to the Federal Parliament of the North German Confederation, took the ground that conferring exclusive rights in industrial inventions is warranted neither by a natural claim on the part of an inventor which should be protected by the State, nor is it sanctioned by general economic principles.

It is the inevitable tendency of all improvements in the arts to cheapen production. Heathcoat's machines reduced our prices of bobbin net lace from five guineas a yard to six pence. The Bigelow looms for weaving ingrain carpets, both reduced the cost of the manufactured article 20 per cent, and improved the quality of the goods. The cotton gin reduced our price of raw cotton, stimulating the production so that it increased in three years from 138,000 pounds to 5,000,000 pounds. The Bessemer process of making steel has so cheapened that most useful article, that from a very limited use before it has now become largely available for engineering purposes. Without the prospect of protection and the accompanying hope of gain, it is hardly probable that Bessemer would have been encouraged to carry on the long series of costly experiment necessary to the perfecting of his process. Without the same inducement the Lowell Company would hardly have ventured an investment of several hundred thousand dollars in developing the capacity and economy of the Bigelow loom, Cartwright would not have been justified in devoting a princely fortune to the creation of the power-loom, nor is it reasonable to suppose that Goodyear would have given his life to the vulcanization of rubber. A great invention is usually a thing of slow development. It is the creation of years of toil and perplexing thought and heroic effort and costly experiment. Without the prospect of reward capital will not go to the aid of the inventor in his uncertain efforts, and it is equally absurd to suppose that men will invent to any great extent from the pure love of inventing, or actuated by the hope of honor and prestige merely. They cannot afford to expend time and energies and means upon that which will, when attained, be at once appropriated by the world at large.

In view of the diminution of labor, the abridgment of time, the annihilation of space—which have marked man's assertion (through the agency of machinery) of his dominion over nature who can withhold assent from the verdict that "the introduction of great inventions is one of the most distinguished of human action;" for, says Bacon, "the benefits derived therefrom may extend to mankind in general, but civil benefit to particular spots alone; the latter, moreover, lasts but for a time; the former forever!" Neither king, nor emperor, nor sage, nor warrior ever won a prouder tribute than the inscription in Westminister Abbey upon the monument of James Watt: "He enlarged the resources of his country, increased the power of man, and rose to an eminent place among the most illustrious followers of science and the real benefactors of the world."

Missouri Lead.—The annual yield of lead in Missouri is estimated to be less than 2,000,000 pounds, though that State may be taken as one of the best lead producing regions in the world. Lead has been discovered in 48 counties and over 500 localities. The St. Louis *Journal of Commerce* reports the receipts of Missouri lead at that city, in 1869, at 172,538 pigs. Receipts of foreign lead 7,856 pigs, and of Illinois lead 26,775 pigs consumed in city, and 15,801 pigs re-shipped. Lead is in Missouri mostly found in sulphuret. Out of 120 specimens of ore referred to by the *Journal* 113 were sulphuret, 6 sulphuret and carbonate, and 1 sulphate. From 60 to 85 per cent of the ore is pure lead. The gangue is generally sulphate of baryta; the ore is often found in magnesian limestone, or red clay interspersed with brown hematite, pyrites, and ocher.

Improvements in Gunpowder and its Manufacture.—One of the buildings of the Luzerne Powder Company, at Wilkesbarre, Pa., recently took fire and was burned to the ground. Although some 400 pounds of powder were in the premises, no explosion took place, and all the workmen escaped without injury. Loss $3000. This Company is working under the patents of Paul A. Oliver, who has made valuable improvements in the quality of powder and in the machinery for its manufacture, whereby safety to workmen is secured, a stronger explosive is produced, and the prime cost lessened. This powder does not develop explosive properties until tamped or confined where it is to act, and then its power is enormous. But when exposed in a loose condition or in kegs it burns slowly without explosion.

Cement for Leather.—A cement for leather is made by mixing 10 parts of sulphide of carbon with 1 of oil of turpentine, and then adding enough gutta-percha to make a tough thickly-flowing liquid. One essential pre-requisite to a thorough union of the parts consist in freedom of the surfaces to be joined from grease. This may be accomplished by laying a cloth upon them and applying a hot iron for a time. The cement is then applied to both pieces, the surfaces brought in contact, and pressure applied until the joint is dry.

PRODUCTS OF THE PINE FOREST.

BY PROF. HENRY E. COLTON.

Turpentine, resin, tar, and pitch, are largely used in various trades, as well as for many domestic purposes. The chief supply comes from the long-leaved pine (*Pinus australis*) of the Southern States. This tree grows from the northeastern boundary of North Carolina, along the Atlantic coast, to Florida, across that State to the Gulf, and thence to Louisiana, in a belt averaging one hundred miles in width.

The soil is sandy, with an under stratum of yellow clay. This whole region is cut by deep, sluggish rivers and immense swamps, almost all underlaid with marl. The manufacture was first commenced at Newbern, in North Carolina, and that State still supplies by far the largest proportion of the product. The first step is to obtain the crude turpentine. This is the natural juice of the pine tree, and is sometimes called white turpentine and gum turpentine. It is a mixture of the essential oil known as spirits of turpentine and of resin. A half-moon shaped box is cut in the tree, as near as possible to the surface of the ground. The shape of this "box" will be seen in Figs. 1, 2, 3, and 4. The box cutting commences about the first of December and continues until March—perhaps a few weeks longer if the spring is late. A hand can cut from 100 to 150 boxes per day; the price now is from one to one and a half cents per box of from one quart to half a gallon in capacity. After cutting, the boxes are "cornered" by taking out a triangular piece at each end of the half moon. This is the commencement of the regular season, and the boxes are now all tasked off. A "task" is usually 10,000 boxes, but we have known hands to tend 18,000. These must be cornered once, and "hacked" about six times, from the first of spring until into November. The dipping (shown in Fig. 2) is done by task work, too, so many barrels or boxes per day being a task. This is accomplished with a spoon-shaped instrument and a peculiar twist of the wrist, only well done by long practice. Two dippers generally attend one hacker. Hacking is the making a groove-shaped cut on each side, downward, to the center of the half-moon. These grooves can be seen in all the cuts. The "hacker" is shown in Fig. 8. It is used with a downward stroke, and has at the lower end of the handle a weight of lead or iron, to give great impetus to the blow. The barrels for filling are placed at intervals through the woods; the dipper gathers his gum in a rude bucket, and empties it into the barrels, which, when filled, are hauled off. A frequent mode of hauling is seen in Fig. 1; the same cut shows a primitive but cheap mode of "rolling" tar to market. Both articles are frequently rafted to a seaport between sticks of hewn timber.

Fig 1.—HAULING TO MARKET AND HACKING.

Fig. 2.—DIPPING THE CRUDE TURPENTINE.

Fig. 3.—CHIPPING THE BOX FACE.

Fig. 4.—GATHERING THE SCRAPE.

The first year's operation produces "virgin dip," the second "yellow dip," the third some common yellow dip and scrape; then the further product of the trees is all "scrape." The virgin dip is, when carefully gathered, a honey-like gum, of whitish appearance. From it are produced No. 1. pale, extra, and window-glass resins. It yields about seven gallons of spirits, and not quite three fourths of a barrel of resin to the barrel (280 lbs). Yellow dip yields over three fourths of resin, and about six gallons of spirits to the 280 lbs. of gum. Scrape yields about the same. "Scrape" is the gum which gathers on the face of the tree or box when worked up three, four, or more feet. It is a white, cheesy-like substance. The operation of chipping the box face and gathering the scrape is seen in Figs. 3 and 4. With care a very light resin can be made from it. The "round shave," an implement used in chipping, is shown in Fig. 9, and the "scraper" in Fig. 10.

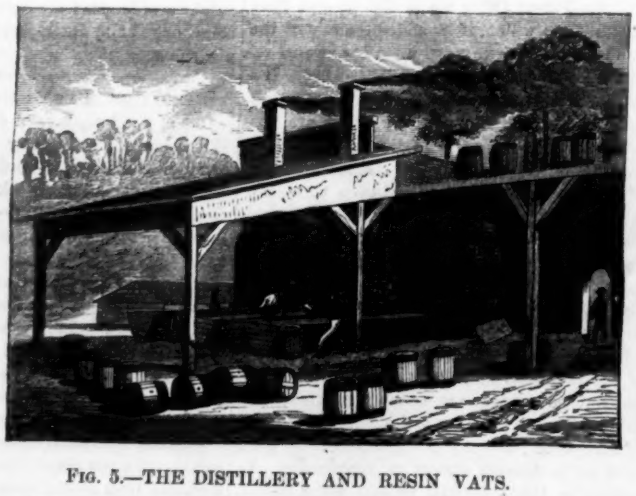


Fig. 5.—THE DISTILLERY AND RESIN VATS.

Fig. 6.—BURNING A TAR KILN.

The operation of distilling the gum is carried on in turnip-shaped copper stills of a capacity from ten barrels up to sixty—the ordinary size being twenty and thirty barrels. They are bricked up at the sides, and the fire strikes directly on the bottom. The top has a large hole for the "cap," which connects with the worm for condensing the spirits, and a small hole through which the "stiller" examines the state of his charge, and lets in water as it may be needed. The resin, being a residuum, is let off on one side into vats, through strainers, from which it is dipped into barrels to cool. Many attempts have been made to use steam as a heating agent, but not yet with success. If the resin is not entirely free of either spirits or water it is opaque and loses value. Previous to the war much white turpentine was distilled for the spirits alone, and the resin run to waste. These (called "beds") in many cases, under the stimulus of war prices, were "resurrected." During Sherman's march a body of troops encamped one night on one of these beds, it appearing to be a vast rock. The resin melting from their camp fires soon caught fire, and they had barely time to save themselves, losing the bridge they had built across the streams in their front. Few will forget the awful grandeur of the burning of one near the distillery at the battle of Bentonsville.

The rear of the stills and the resin vats are shown in Fig. 5. Probably the largest distillery in the country is at Wilmington, N. C.

The profits of this business depend entirely upon the vigor with which it is pushed, and the economy with which it is conducted. A store usually accompanies and adds to the profits of a country distillery. A task of 10,000 boxes may safely be calculated to yield two hundred and fifty barrels of virgin or yellow dip in a season. If convenient to railroads, cities, or towns, the trees, when worked out, are cut into cord wood, quantities of which now find their way to New York. In trees deadened by fire, stumps of trees cut down when the sap is up, and old boxed trees left standing, a peculiar transformation of the wood takes place; all its pores become filled with pitchy matter, it increases greatly in weight, and will take fire almost as readily as gunpowder. In this state it is called "light-wood," because it is used for kindling, and with the poor as a substitute for candles or other light. The smothered burning of this wood is the source of tar. The wood is split into billets three or four feet long and about three inches in diameter. To form a tar kiln the operation is commenced by scooping out of the ground a saucer-shaped foundation, making a hole in its middle, and thence running a wooden spout outside the rim of the foundation. Billets of wood are then placed radiating to this center hole and piled upward, each upper and outer stick lapping a little over, so that when finished, the pile (as shown in Fig. 6) resembles a cone with the point cut off, small end down; logs of wood and green twigs are then piled around, and the kiln thus made is covered with dirt, the top as well as sides. The fire is then lighted at the top eaves of the kiln, and the tar trickles down to the center hole, whence it runs out through the spout. A kiln yields fifty, one hundred, or more barrels of tar, according to its size. Large iron retorts have been used, but the product is not sufficiently greater or more cleanly to pay for increased cost. In process of distillation a tar and pitch are obtained. Pitch is tar boiled down until all its volatile matter is driven off. The manufacture of tar is chiefly carried on by the poor whites and negroes. It is but seldom the object of regular work, being rather a job for odd times. The kiln burning is generally a frolic, or was in olden time. Few sights have in them more of somber grandeur than a large tar kiln at night. Its immense columns of slowly ascending smoke are now and then illumined by the leaping forth of a tongue of flame. The wild cries of the men in their efforts to cover it quickly with earth add to the wildness of the scene.

A diagram of the construction of a tar kiln is given in Fig. 7. A is the pit to receive the tar which flows through the gutter, B, from a hollow space, C, in the kiln, into which it drips from the burning wood. D are strips of light wood laid with their inner ends sloping toward the center. E E E is a space between the green pine logs, F, which inclose the whole. This space is tightly packed with turf, and the top of the kiln

is covered with the same material, except at G G, where the fires are first placed.

Lumber made from trees that have been boxed has a beautiful white, rather hot-house plant look, but will not last so well, nor is it so strong as that which has never been boxed. Fire and worms sometimes destroy immense tracts of the pines, and hundreds of thousands of dollars worth of trees have thus been rendered valueless. The traveler along any railroad of the Southern Atlantic coast will be greeted with the sight of the gaunt, ghost-like, leafless monuments of these destroyers.

Spirits or oil of turpentine is used in painting, the manu-

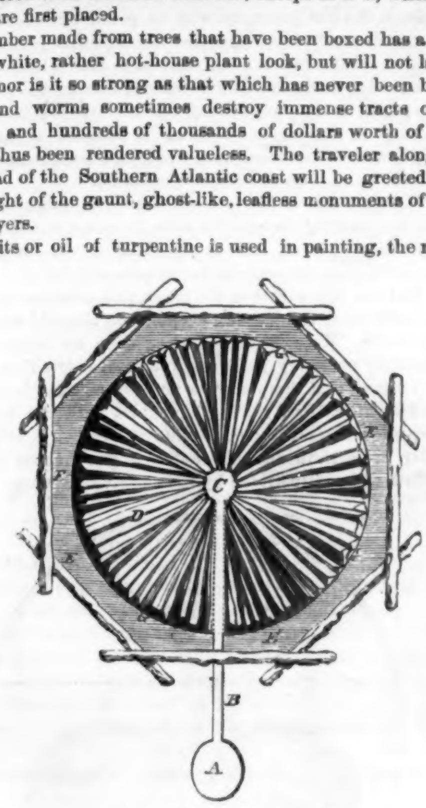


FIG. 7.—DIAGRAM OF A TAR KILN.

facture of varnishes, oil cloths, etc., and as a medicine. It has peculiar characteristics in which respect no substitute for it has yet been found. Benzine took its place to some extent during the war, but with the regeneration of Southern industry that has been abandoned. Still, with a less production than before the war, it is sold at about the same price. The discovery of petroleum has lessened its consumption, the spirits having formerly been used with alcohol in the manufacture of burning fluid and camphene. Many were the shifts made to dispense with its use during the war; some varnish manufacturers erected costly apparatus for collecting the spirit thrown off in melting kowrie gum. White paints mixed with benzine rapidly turn yellow and peel off, while with spirits of turpentine they grow whiter, are elastic, and tenacious. These qualities are attributed to its property in absorbing oxygen or transmuting that gas into its allotropic form—ozone. As a medicine it is diuretic, so powerfully so that sailors of vessels loaded with it are sometimes intensely affected by its fumes; rubbed on the joints it has a strange, and if often repeated,

FIG. 8.—HACKER. 9.—ROUND SHAVE. 10.—SCRAPER

an injurious effect. Chemically it is a hydrocarbon, being $C_{20} H_{16}$. It is a powerful solvent of india-rubber, and if allowed to stand exposed to the air for a length of time is said to obtain the power of bleaching vegetable colors. A substitute was endeavored to be made for it by distillation of the white pine wood in iron retorts, and even yet a species of spirit is made by distillation of that wood, and also of the long leaf pine, but it belongs to the methylic series, and when deodorized is used as a substitute for alcohol in dissolving aniline crystals in dyeing. Pine rosin or resin enters largely into many manufactures. The pale window-glass article has a share in the soap which graces the toilet of the belle, and the dark grades go far to make up the coarser bar. It helps to wash our clothes and to mend the tin caldron in which they are boiled. It furnishes gas light for hundreds of the smaller towns, helps to paste up our thousands of placard advertisements, and assists in sizing the manufacturer's cloth. It is used for making lampblack, and is largely distilled for its oil and residuary pitch. In 1860, $550,000 of capital were invested in this last branch of business alone, and there is equally as much now, while the character of the product has been greatly improved.

MANY cases of poisoning have occurred by contact of guano with wounds. It should be handled with gloves.

WOODS' SAW-GUMMING AND SHARPENING MACHINE.

The desirability of replacing the old and tedious method of filing saws, has led to the invention of various devices designed to perform the work in a more rapid and accurate manner; and the file is fast giving way to the emery wheel.

Our engraving illustrates a machine employing a wheel of

this kind, of very simple construction, and apparently well adapted to accomplish the end desired. It is the invention of Mr. S. A. Woods, whose wood-planing machine and wood-molding machine were described on pages 90 and 135, current volume.

The working parts are constructed upon a triangular iron frame, upon the top of which is suspended a swing frame, the back end having a driving shaft (forming the hinge) with tight and loose pulleys; from this, power is transmitted to the arbor upon which is secured a solid emery wheel. The arbor on which the saw is placed is so arranged that universal motion is readily obtained to accommodate any sized saw or shaped tooth desired. The wheel is held away from the saw by means of a coil spring, under the swing frame. The frame is pressed down, bringing the wheel in contact with the saw with one hand, and the saw turned on the arbor with the other; thus the slightest touch can be given to the tooth of the saw without injury. The position of the operator is such that he can look directly across the tooth of the saw, and judge correctly when it has received the finishing touch. A device can also be attached for sharpening straight or mill saws (not shown in the cut). The speed given to the emery wheel is from 1,800 to 2,000 per minute.

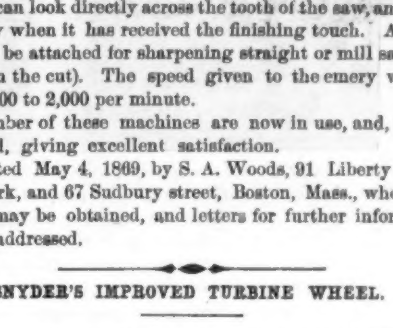
A number of these machines are now in use, and, we are informed, giving excellent satisfaction.

Patented May 4, 1869, by S. A. Woods, 91 Liberty street, New York, and 67 Sudbury street, Boston, Mass., where machines may be obtained, and letters for further information may be addressed.

SNYDER'S IMPROVED TURBINE WHEEL.

This invention consists in a peculiar form and construction of the buckets in turbine wheels, the form adopted being distinctly shown in Figs. 1 and 2—Fig. 1 being a plan of the wheel, and Fig. 2 being a perspective view of the interior portion or wheel proper.

Fig. 1



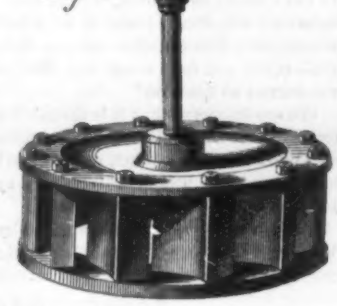
It will be seen that the general form of the buckets is that of a triangular prism, the most acute angle of the triangle being toward the interior of the wheel.

The wheel is of the kind known as center discharge, and the water is carried to the buckets by a scroll, which scroll is divided by a partition, so that one half of the water, as it enters the gate, is carried half way around the wheel before it reaches the buckets and acts there with full force.

The outer edges of the faces of the buckets, which receive the impact of the water, are curved somewhat abruptly inward for a short distance, and then extend in a true plane to the point of discharge. The discharge takes place through the bottom of the wheel, as shown in Figs. 1 and 2. The back faces of the buckets are perfect planes, and the spaces between them are somewhat narrowed toward the point of discharge.

Fig. 3 is a perspective view of the wheel when placed in the scroll, also showing the method of supporting the lower bearing of the

Fig. 2

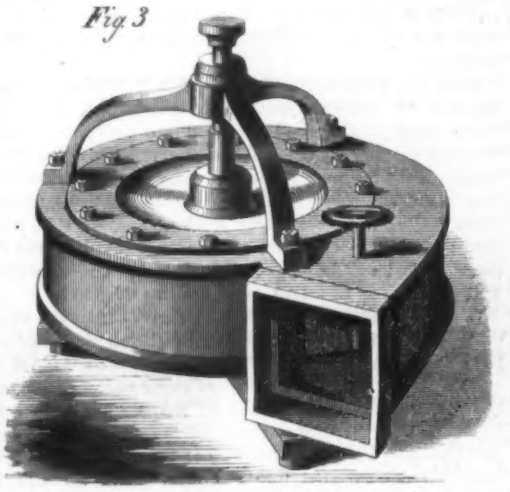


upright shaft, and the attachment of the wheel to the shaft.

It is claimed that the construction of the buckets described, secures the full force of the water against the extreme leverage of the wheel, and that thereby its power is much increased over that of other forms of turbines.

Patented, through the Scientific American Patent Agency, May 25, 1869. Further informa-

Fig. 3



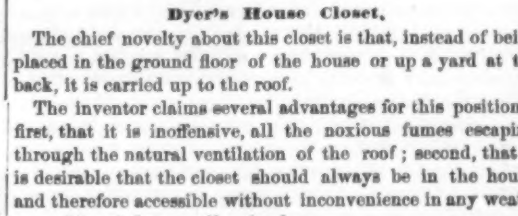
tion and circulars may be obtained by addressing the patentee, William H. Snyder, Phelps, Ontario Co., N. Y.

Dyer's House Closet.

The chief novelty about this closet is that, instead of being placed in the ground floor of the house or up a yard at the back, it is carried up to the roof.

The inventor claims several advantages for this position—first, that it is inoffensive, all the noxious fumes escaping through the natural ventilation of the roof; second, that it is desirable that the closet should always be in the house, and therefore accessible without inconvenience in any weather, and by night as well as by day.

The peculiar form of the receptable also (a long straight tube of about 9 inches in diameter) is stated to possess great



advantages. First, the surface that can give off noxious fumes is greatly diminished. Second, that surface is always covered by urinary deposit, and the fæces are thereby prevented from disseminating the germs of disease. Third, by means of the orifice at the bottom, the contents of the tube can be removed at any time without offense to the residents. Fourth, the valuable manure which is wasted by the cess-pool system is carried away in an undiluted state, and may be applied to the ground at once by means of subsoil plows which entirely conceal the deposit. Fifth, it is claimed that this is an inexpensive mode of storing human excreta, as the labor of removal is much diminished, being chiefly performed by natural gravitation.

The closet is placed at least 8 feet above the floor of the attic, and the ceiling of the closet is perforated, and communi-

cates with the vacant space in the roof. The tube passes through the back wall of the house, and descends to within 4 feet of the ground. At the bottom of the tube is fitted a perfectly tight draw valve. When the tube is full, or at stated periods, an air-tight tank is brought round to the back of the house, a gutta-percha hose of sufficient length is fitted to the valve, which is then opened. The column of fecal matter, six sevenths of which is fluid, some 30 feet, 20 feet, or 10 feet in hight, then rushes into the tank. The valve is then shut down, the hose removed, and the joints of the valve are washed with diluted carbolic acid. The liquid manure is then conveyed beyond the limits of the city, and is distributed in properly constructed casks which are affixed to Liernur's subsoil plow, of which an illustration is given.

These plows, being driven over some of the exhausted soils in the vicinity of the city, will at once restore to them the valuable manures of which they have been despoiled for years past. The offensive manure is then effectually hidden from sight, and from smell, and the "wilderness will be made to blossom as the rose."

We are informed that it is intended to form a company to supply the whole apparatus to houses and to remove the soil at a fixed rate per annum, and also to lease a large area of barren land which is to be reclaimed by the aid of the valuable manure now worse than wasted.

The invention has been patented by Mr. J. Dyer, of Melbourne, Australia.—*Mechanics' Magazine.*

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

A Final Zoic Catastrophe.

Messrs. Editors :—In your issue of Feb. 12 (page 110), is an extract from Prof. H. Wurtz, in which it is stated that through the agency of marine animals, that secrete carbonates from the ocean water, the carbonic acid of the atmosphere is passing "into solid forms, permanent and forever unavailable thereafter," and that soon, geologically speaking, the atmosphere will be exhausted of its carbonic acid, and all organic life come to an end; the burning of the fossil coal by man postponing the catastrophe but temporarily, etc.

Since the publication of Mr. Lyell's "Principles," many theories of igneous and cataclysmic catastrophe, formerly in vogue among geologists, have fallen into disrepute, as being founded on imperfect or fragmentary knowledge of the facts. In the progress of discovery one side of a cycle comes into view, and the "great machine seems to be running down." But further research discloses another side, where forces of equal potency are "re-winding it." Had the Professor looked a little deeper, he might have seen evidence that the crust of the earth, even, has two sides to it.

In some localities, carbonic acid derived from the atmosphere, is, by the agency of marine life, being deposited and locked up in the layers that are forming on the *outside* of the earth's shell. But similar beds of calcic and magnesic carbonates, which were deposited in past ages, are in other localities being acted upon by the heat from *within* the shell, and converted into igneous silicates; the carbonic acid being liberated and poured into the atmosphere through the fissures, vents, and craters of several hundred volcanoes.

This flow of carbonic acid, which is a constant accompaniment of volcanic agency, often takes place at great distances from the actual crater, and continues for ages after volcanoes have become extinct. In Auvergne the springs are charged with it. In California, I have seen the granites, and other igneous rocks, as soft as putty from the percolation of acidulated water through them. M. Fournet reports encountering emanations, while opening the mines of Pontgibaud, that often burst into the galleries with explosive force, roaring like the steam from a boiler, filling the lower parts of the mines and pouring into the valley in sufficient quantity to suffocate horses, geese, etc.

From the Grotto del Cane, or from similar excavations, this gas has been flowing since the days of Pliny. "But the quantity evolved there is trifling," says Prof. Silliman, "compared to that which escapes constantly from Lake Solfatara, near Tivoli, whose surface is violently agitated with the gases boiling through it."

In the Island of Java there are some fifty volcanoes. Accordingly the flow of carbonic acid is so great, that in the celebrated "valley of poison," the ground is said to be covered with skeletons and carcasses of tigers, goats, birds, and even of human beings, that have ventured into the valley and been suffocated by the gas.

Very likely, at great depths, in these volcanic regions, stratified rocks are now being transformed to granite. It is believed that the granitic rocks of all the loftiest mountain chains, such as the Andes, Alps, Himalayas, etc., were once ocean mud, containing the usual proportion of carbonic acid; and that the carbonates have been changed to silicates, and the included carbonic acid returned to the atmosphere, since England was inhabited by pachyderms, bats, opossums, and monkeys. (Lyell's Manual, p. 231—Appleton & Co., 1864). In the central Alps nummulitic and even newer tertiary strata are found transformed to gneiss, a sort of half granite.

Thus the carbonates secreted from the Eocene sea by the little nummulites, have "rendered up again the treasure of carbonic acid in their marble grasp," by the action of just such a "fervent heat" as that which is now transforming the rocks, and slowly elevating the land in volcanic regions. (Dana's Manual, p. 721-725).

Belts of submarine volcanoes seem to be performing a similar operation upon marine deposits which contain the corals, crusts, and shells of existing species. Such beds are being buried deeper and deeper. Vast accumulations of "ashes," pumice, and cinders, are thrown up from below by eruptions, and then reduced to mud and spread out by the waves; alternating with floods of lava. Thus calcareous deposits are buried, and tend to become the inferior and underlying strata, where they will in time be transformed and decarbonized by the heat.

But this continual volcanic exhaust and depletion of the earth's liquid interior produces collapse; and, consequently, a lateral tension in the crust, which slowly bulges upward in a long wrinkle. This involves exposure to the denuding forces. First, by the dash of waves; afterwards by the action of rains, torrents, glaciers, etc.; the surface rock is scraped off again, and the gneiss, granite, etc., exposed.

In various places all these different operations are being slowly performed. Mountain chains are in the bed beneath the waves of the sea. Those who suppose that the earth is dead, and getting cold, are mistaken. So late as the middle of the Eocene tertiary period, nummulites and other marine animals luxuriated in the sea, on the very spots now occupied by the Alps and Himalayas. There was no more promise *then* that they would rise to their present altitude, than there is *now* that similar mountain chains will come up from the depths of the sea during the coming ages. "The Zoic Catastrophe," therefore, cannot be deduced from the facts of Science.

J. W. Pike.

Windham, Ohio.

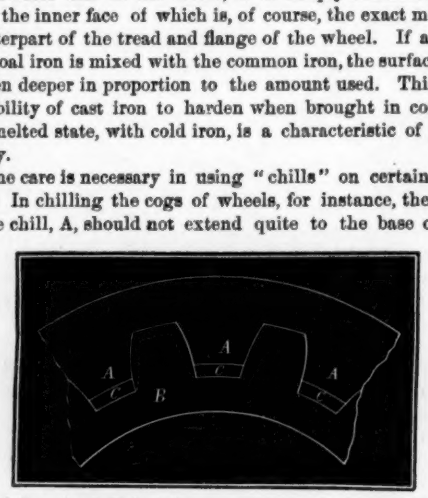
Chilling Cast Iron.

Messrs. Editors :—It is well known that the surface of iron castings is extremely hard, and that this hardness sometimes extends nearly, or quite through, when the casting is very thin, or when a certain quality of iron is used, termed "charcoal iron," such as is used for malleable articles.

On thick castings, made of good machine iron in a common sand mold, this crust is quite thin, hence when a thick, hard surface is needed on any portion of such castings, it is necessary to use a metallic mold at that point. These partial metallic molds, termed "chills," are fitted up with much care, and are so placed in the sand mold as not to mar the true symmetry of the casting.

In the casting of car wheels a "chill" constitutes the whole outer rim of the mold; it is simply a massive iron ring, the inner face of which is, of course, the exact mold or counterpart of the tread and flange of the wheel. If a little charcoal iron is mixed with the common iron, the surface will harden deeper in proportion to the amount used. This susceptibility of cast iron to harden when brought in contact, in a melted state, with cold iron, is a characteristic of great utility.

Some care is necessary in using "chills" on certain castings. In chilling the cogs of wheels, for instance, the cogs of the chill, A, should not extend quite to the base of the



cogs of the wheel, B, but the space, C, should be molded with sand, then the chilled surface will take somewhat the form indicated by the dotted lines; in this way the full value of the chill is obtained without impairing the strength of the rim of the wheel. Another advantage of chilled cogs is that they may be made nearly as perfect as cut ones, because the cogs of the chill may be formed in a gear engine as perfectly, of course, as the teeth of any gear wheel, and the chill is free from other imperfections of a sand mold.

F. G. Woodward.

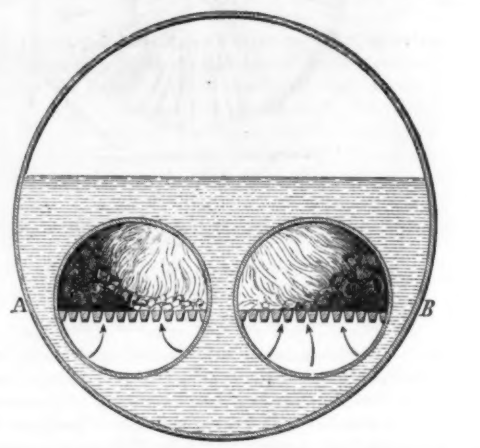
Firing under Steam Boilers.

Messrs. Editors :—Seeing an article in your journal, headed as above, I beg leave to offer you my experience both in this county and in Europe, on the above subject, and if engineers and firemen will give it a fair trial, I think they will find, as I have done, a saving of from 10 to 25 per cent in *fuel*, besides much less labor for the fireman and less danger to the boiler from expansion and contraction while under working pressure.

THE FURNACE.

After seeing that all fittings of the boiler are in the best possible order, turn your attention to the furnace. There is more required here than the simple process of feeding the fire with fuel. In the first place the nature of the coal should be ascertained, and if it be of a coking kind the grate bars will require it to be more open than for coal of a light and gaseous nature. Adjust the grate surface to the heating or absorbing surface of the boiler; this will greatly depend upon the quantity of the fuel and the draft, and the quantity of steam required. If the draft be good, work a thick fire, but do not break the coal excepting it cannot be got in at the furnace door, taking care to feed the furnace on one side, not covering more than one-half of the grate at a time. When that is sufficiently coked feed the other side, putting plenty on at a time, leaving the fuel at the middle of the furnace much lighter and thinner than at the sides, and keeping the grate bars well open. The placing of the coal on one side at a time will prevent the formation of a great portion of the smoke which would otherwise result, and produce a more steady heat. The coal so placed will partially damp the side of the furnace on which it is placed; therefore the necessity of stoking the furnace when the steam is up. By this method of firing, the gas generated will be given out slowly. The greatest quantity of air will pass through that portion of the grate where the fuel is most consumed and where the coal has not been made small by breaking, leaving the interstices wide; and as the oxygen of the air will be in sufficient quantity if this mode of firing is adopted to unite with the gas as it is extracted from the coal, a continuous flame of gas will be kept up and smoke prevented.

When one side of the furnace so fired is sufficiently coked raise the burning fuel gently with the poker but do not break it into pieces; at the next firing, place the coal on the other side of the furnace, and similar results will follow. Replenish first one side and then the other, and continue to do so in the working of the furnace, keeping out the cold air as much as possible. Keep the furnace door open no longer than is absolutely necessary, and place your coal before firing near to the furnace, that there may be no loss of time in charging the fire; all cold air coming in contact with the boiler lets down the temperature and does harm. With a double fire-box boiler, fire each furnace alternately in the manner above described, and as illustrated by the engraving, where A and B



represent the sides of the fires last stoked, and the gas given out from the new fuel mixing with the air which passes in the greatest quantity through the thin portion of the fire, as indicated by the arrows. Being thus mixed with air at a high temperature, the gases ignite, and comparatively thorough combustion is secured, preventing smoke and saving fuel. This mode of firing is applicable to most furnaces, whether single or double fire-box, or wholly beneath the boiler.

By all means avoid having a dirty ash pit. A pit nearly full of ashes is a sure sign of bad management, it is necessary to keep the ash pit of a furnace clean and cool and the air as dense as possible, as it is to feed the fire with fuel. If the ash pit be hot the heat will expand the air and the furnace will require greater quantities to pass for the required amount of oxygen which would be supplied by less quantities of cold air. When convenient, use water for the bottom of the ash pit, allowing it to remain to quench the ashes as they fall from the furnace; the evaporation will tend to keep the grate cool.

A great body of fire will evaporate more water with less proportion of fuel than a small and thin fire. The greater the intensity of the fire the more steam will be generated with the same amount of fuel. Where there are a number of boilers it is important that the duty of stoking should be properly attended to; and as smoke is a great nuisance easily prevented, its prevention is a duty which each engineer ought to fulfill.

Major Clegg.

La Crosse, Wis.

Liquid Fuel for Steam Engines.

Messrs. Editors :—I have read in the Scientific American many valuable articles on combustion, in which it has repeatedly been asserted that chemists prove by experiment that only 10 or 12 per cent of the total heat produced by the combustion of coal is utilized in the steam engine under ordinary circumstances. In connection with this subject, I would state that we have here in Washington, a couple of inventors that claim to do better in the production of heat than has yet been accomplished, as they have had published in every paper here that by their petroleum apparatus they can run a sixty-horse steam engine at the rate of 17 cents per hour; the combustion is so perfect they say that the flame extends the whole length of the boiler, say about 25 or 30 feet, and several feet into the smoke stack, and no smoke can be seen coming from the stack.

Those are wonderful statements to any one who has been led to believe that, in all experiments in burning petroleum, the conclusions have always proved that petroleum is about eight times dearer than coal. As for the statement that no smoke can be seen escaping from the smoke stack, as a large black cloud of smoke extending far away in the distance can be seen, whenever the apparatus is at work, arising from said stack, it is rather ominous.

This apparatus consists in a tubular boiler, in which steam is passed through the tubes, and by its heat vaporizes the petroleum which is contained in the space between the tubes. The vapors are passed through a spongy mass and a metallic sieve, and are held in a receiver forming the outer jacket of the boiler. The gases or vapors are burnt at any convenient point, being conveyed through steam pipes. Another claim is that the steam is passed through the fire-place, and there decomposed and fed into the pipes jointly with the vaporized petroleum. This is in substance the whole apparatus, and

how the inventors ever formed the estimate of 17 cents per hour is beyond my knowledge, as they have never run it for even a whole day. If their statement is true then the experiments made through the patronage of the Navy Department must have been made by persons incompetent to carry out a correct experiment; if, on the other hand, the Navy experiments have been properly made, this 17 cents per hour statement must be taken with strong faith.

In regard to decomposing steam to burn it, it is generally conceded that no heat is gained, therefore this part of the apparatus can not add to its efficiency. It would seem then that this more than wonderful result is simply obtained by burning vaporized petroleum. This is rather a late day to bring such claim forward with the present knowledge of the usefulness of petroleum. C. COLNÉ.

Washington, D. C.

Water as a Fulminate.

MESSRS. EDITORS:—The active investigations going on at present concerning steam-boiler explosions seem to demand all the scientific knowledge and facts as far as known of the characteristics of water. I have examined it, and witnessed it, as a fulminate in two different conditions. In the one case, in the spheroidal state on a hot, metallic plate; in the other in a similar condition from a mixture of warm and cold air in a storm-cloud. In both cases it plays the part of a fulminate. When I drop water on a hot plate, below a red heat, it rolls about without making noise or steam. When the spheroid is rolled over the edge of the hot plate on to one of lower temperature it explodes. If, however, it be struck with a hammer while rolling about on the hot plate it goes off like a fulminate, resembling the crepitating noise of thunder, as heard by an observer immediately above the cloud in which it occurs.

In the case of spheroidal water, as noted in "Silliman's Principles of Chemistry," the author says "Water passes into this condition at 340°, and may attain it even at 288°. A grain and a half of water in this state at 392° requires 3·30 minutes to evaporate." If you drop the water on a plate of low red-heat it oxidizes the plate, and necessarily deoxidizes the water, freeing its hydrogen. Now it is well known that water in a spheroidal condition is ensconced in an atmosphere of its own vapor, and this vapor being a non-conductor, chemists say its formation abstracts the sensible heat from water, and leaves the temperature of the fluid at 205°; and this would seem to be a correct statement, as I find my spheroid to leave no watery track as it floats on its vapory cushion over the hot plate undisturbed, but as soon as it is struck with a hammer the watery trace becomes visible on the plate and on the hammer. This envelope of the spheroid must be of considerable tenacity, as indicated by its bursting and fulmination when struck with the hammer.

The book referred to says, "If a thick and heavy silver capsule is heated to full whiteness over the colipile, it may by an adroit movement be filled entirely with water, and set upon a stand, some seconds before the heat declines to the point when contact can occur between the liquid and the metal. When this happens, the water, before quiet, bursts into steam with almost explosive violence, and is projected in all directions."

Now let us apply these known characteristics of water to its action in steam boilers, and see whether it can account for *some* of those terrific explosions too frequent of late.

As soon then as a heat of 340° accumulates in the boiler plate it produces the spheroidal state in the water in contact with it, and as long as that temperature is maintained, the spheroidal condition continues, and if all that boiler surface covered with water attains that temperature, its inclosed water immediately becomes a spheroid inclosed in its fulminate shell, ready to burst explosively as the drop in the eolipile, as soon as the temperature falls to the maximum steam-generating heat. In a tubular boiler of comparative great water surface to a given capacity of water room, such high temperature of boiler shell is soon acquired upon a cessation of motion in the engine; and *vice versa*, when the furnace doors are suddenly thrown open allowing a rush of cold air to the boiler shell, causing this tenaciously bonded fulminate to give out suddenly its pent up power, as do the insidious granules of gunpowder in the bomb-shell, when they are touched by that mysterious agent, fire.

The work referred to says "The quiescence of the spheroid of water, as it rolls to and fro over the heated plate, is due to the elastic force of its own vaporous atmosphere, as well also as to the repulsive action of hot surfaces." This is not a lucid explanation to my comprehension. I suggested to a high authority of science that electricity played a conspicuous part in the phenomenon, but was told it did not. I hold that heat, oxygen, fire, and galvanism, are only different forms or modes of that one mysterious element we denominate electricity, and that in the spheroid of heated water its positively-electrified repulsive power is balanced by the equally positively-electrified heated boiler shell; and that a change, or reduction of the electrical tension in the heated plate, rendering it negative to the spheroidal water, or, *vice versa*, by a reduction of the electrical tension in the spheroidal atmosphere of the water, will necessarily cause an explosion.

But lay the electrical theory aside, and take the simple fact of water "in a spheroidal state," as explained by M. Boutigny—the water in the capsule—the experiment of Perkins, and the water on the hot plate, and we have the evidence that water in a boiler may, and does, become spheroidal at a temperature of 340°, and must then float about upon its self-created atmosphere, exerting just as much repulsive pressure against the shell of the boiler, as does the heated boiler shell against the water, bringing the two forces into equilibrium; and that as soon as this balance of power is broken, by any of the causes always incident to such conditions, an explosion must follow. The atmosphere surrounding the spheroid suddenly expanding into a large volume of steam, while at the same instant its liberated heat converts the inclosed liquid into an additional volume of steam, and, unless such boiler is made with the same comparative power of resistance as a gun-barrel is made, it will burst; that is to say, if it has not a vent or opening like the gun-barrel, to let off the expanding force, and a sufficient resisting strength for the initial shock, an explosion must result.

Boiler explosions have always on examination appeared to me more like the explosion of a bomb-shell than one caused by the gradual augmentation of steam pressure over and above the resisting strength of the boiler. That steam boilers may explode from this simple cause of over-pressure, is not to be denied, but in all *such* cases they must at best be but poor magazines of power.

My article being already long, I will omit for the present the analogous fulminating characteristics of water spheroids as formed by the commixture of cold and warm air in the formation of a thunder cloud, and the electrical explosions they give rise to as they fall from the upper to the lower cloud.

Lancaster, Pa. JOHN WISE.

Running Locomotives a Mile per Minute.

MESSRS. EDITORS:—I observe in your issue, of February 26, C. P. L., of Minnesota, asks, "Are railroad locomotives with 6½ feet drivers capable of exhausting fast enough to allow them to run at the rate of one mile a minute?"

I answer this question—with conditions, "Yes." Those conditions being several in number, I will not enumerate all, but the principal ones.

1st. The size and weight of train, etc.

2d. Gradients, and state of rail, wind, and weather.

3d. Capacity of boiler for generating desired amount of steam.

4th. A proper proportion of area of passages or parts of cylinder and nozzles to exhaust, for free ingress and egress of steam before and after using.

5th. A good valve motion to use steam expansively and to the best advantage previous to link motion.

Various devices were used to work steam expansively, and among those first were the variable cut-off, etc. I once ran an engine (the Samson) on the Great Western Railway, of Canada, from Lynden station to London, 61 miles in one hour and twenty-five minutes.

The train of circumstances occurred thus: The accommodation west, Patterson Hall engineer, with engine "Firefly," ran off track at Lynden, when the engine "Samson," cylinders 16 by 22, 6 ft. 2 in. wheels, when new was ordered to relief, and at 12:15 P. M. left with two passenger cars and one box car for London, made nine actual stops, and slacked up once at Smith Creek Bridge, at Harrisburgh, and Paris, changed baggage, etc., on the branch of cross roads, and arrived in London at 1:40 P.M. being one hour and twenty-five minutes on the journey.

Mr. Brodie, late (if not the present) station master of London, was conductor, D. McCarthy, fireman, and the train was run at the solicitation of assistant Superintendent E. S. G. Colpoys, late of the Great Indian Railway, Calcutta. At one station (Beachville) the train was run by, a distance equal the length of it, and backed up for passengers, and the delays at stations occupied about fifteen minutes; besides, nine miles of the distance was up a heavy grade, and consumed 13½ minutes. WALTER S. PHELPS.

Muncie, Ind.

Absorption of Oxygen by Charcoal.

MESSRS. EDITORS:—In an article entitled "Spontaneous Combustion," in No. 16, of Vol. XXI, Dr. Jackson says that he has found that charcoal when freed from dampness absorbs oxygen very rapidly. Is there not in this peculiarity of charcoal a source of cheap extraction of oxygen from the air? Charcoal might be heated to a certain degree when it would absorb oxygen, it would then be made to yield it up; the gas could then be passed through water and received in tanks ready for consumption.

In these days of search for cheap fuel and light, may we not have an unlimited supply of oxygen in the air waiting to be extracted? May not this substance be as suitable as manganate of soda used in the *Tessié du Motay* system of extracting oxygen? Charcoal is cheap, and any chemist having a suitable apparatus can easily make the experiment.

This idea is thrown out for what it is worth, and I hope any one making the experiment will report the result in the SCIENTIFIC AMERICAN. C. C. S.

Washington, D. C.

Waste of Labor in Building.

MESSRS. EDITORS:—Apropos to your article under this heading, the writer noticed a device in use in Paris, Lyons, and Marseilles, which might be copied to advantage in cities with a good water supply.

The basement being constructed and sewerage and water connected, two wrought-iron tanks come on the scene, about six feet square, and say two feet deep, covered with a stout wooden platform. Six upright timbers are fixed to serve as guides, as in an ordinary hoist. The tanks are attached by a chain passing over a pulley at the top of the uprights, the length of which is regulated from time to time, so that while one tank is on the ground the other is at the hight where materials are to be delivered. Each tank has a funnel opening at the top and a plug valve at the bottom. The water is led up in flexible hose to the place where the work goes on, and one tank being down and loaded, water is let into the upper one until the weight to be raised is counterpoised, when down goes the water and up comes the material, which, on arriving at the landing stage, is secured and unloaded. Meantime the plug valve has emptied the bottom tank it is loaded, and water being put into its elevated companion they change places as before. In this way blocks of stone, bricks, timber, tiles, and the workmen themselves go up and down rapidly, and without fatigue. The apparatus does not cost more than a derrick and tackle, and is easily taken down and moved from place to place.

There is a brake to prevent too rapid descent, the rounds placed at the sides to form a ladder, and other points which I have probably overlooked. VOYAGEUR

Toronto, Canada.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of January, 1870:

During the month, 372 visits of inspection have been made; 766 boilers examined, 714 externally and 207 internally; while 54 have been tested by hydraulic pressure. Number of defects in all discovered, 270; of which 23 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 9; fractures in all, 21—1 dangerous; burned plates, 23—3 dangerous; blistered plates, 30—2 dangerous; cases of incrustation and scale, 42—1 dangerous; cases of external corrosion, 41—3 dangerous; cases of internal grooving, 8; water gages out of order, 8—1 dangerous; blow-out apparatus out of order, 2; safety valves overloaded and inoperative, 9—1 dangerous; steam gages out of order, 46—4 dangerous. These gages varied from—25 to + 12. Cases of deficiency of water, 6—2 dangerous; boilers without check valve in feed pipe, 6—6 dangerous.

It will be noticed in the foregoing report that there have been found 30 blistered plates, on two of these in one boiler were found six large blisters, which so reduced the strength of the material that it became necessary to renew the plates. All parts of the furnace and fire sheets of boilers should be examined at stated intervals with a view to detect these defects—they are not especially dangerous if attended to in season. Two boilers examined during the month were so badly weakened by corrosion and fractures that they have been condemned as unsafe and beyond repair. New ones are being supplied. We not unfrequently find boilers without hand holes. This is a great oversight on the part of boiler makers, and we especially call their attention to this matter. Several cases have come under our notice this month when the fire-box sheets were badly burned by collection of sediment in the water legs, no hand holes being provided by which this could be removed. Again, we not infrequently find boilers set in angles of the building, where if they are furnished with hand holes, they are inaccessible from the boilers being set so near, or in direct contact with the wall. In the construction and setting of boilers every facility should be given to make the matter of removing sediment free from unnecessary trouble.

Steam gages, it will be noticed are frequently found incorrect. This can only be detected by making frequent examinations and comparing them with a test gage. To show how liable boiler appliances are to be neglected, the attention of an inspector was recently called to a steam gage that had not varied in its indications for a month; on examination it was found that a stop cock in the pipe leading to the gage was turned so as to shut the steam entirely off from the gage. This cock being opened the gage was all right.

In another instance, where the steam gage was not working, examination ascertained the fact that the steam-gage pipe entered the boiler through the head, and then turned a right angle, descending perpendicularly below the water line; the pipe was filled with sediment at the lower end, hence the gage was useless.

We mention these cases to show how a little carelessness in fitting or working a boiler may be a source of danger. We have frequently urged the importance of providing boilers with all necessary fittings, also that engineers give them daily attention. Attachments are not placed on boilers to make the engineer less vigilant, but to keep him constantly on his guard.

We repeat what we have frequently said. Raise the safety valve slightly and carefully, allowing it to return to its seat easily and without concussion, this should be done daily at least. See that the steam gage is in working order, and if for any reason it is thought to be incorrect in its indications, have it attended to at once. Keep the gage cocks clean and bright, not allowing them to become foul and incrustated, and if provided with a water gage, see that it is in working order.

With vigilance in these particulars the dangers of *low water* and *high steam* will be entirely avoided.

Tunnel Photographs.

We are indebted to Messrs. Rockwood & Co., 839 Broadway, mechanical photographers, for a series of stereoscopic and other photographs illustrating the pneumatic railway under Broadway. As the works are entirely below the surface of the street, artificial light was employed, in the use of which the photographers have been very successful. The illumination was obtained by means of two large and powerful oxy-hydrogen calcium light. Photography has been brought to such perfection that even the bowels of the earth yield to it their mysteries, and Broadway has proved no exception. The pictures were taken with the entire travel of the street, omnibus, carts, carriages, and steam fire engines, all trotting directly over the head of the artist.

Step Support for Mill Spindles.

The main object sought to be obtained in the improved step support for mill spindles, of which we give engravings herewith, is to secure perfect truth in the perpendicularity of the mill spindle to the face of the bed-stone. The collateral advantages thus secured will be apparent to practical millers and millwrights.

The improvement consists in the arrangement of the step in the top of a vertically-adjustable tube or other sliding support, provided with vertical guides, and working through guide plates, to insure the vertical position and to prevent rattling; the said support being mounted on a rod rising up from the bridge-tree and jointed to it, so that the joint may compensate for the curve described by it, due to the one end of the bridge-tree being fixed and the other swinging around the fixed point, and the step may be raised in a right line.

Figs. 1 and 2 are, respectively, a side elevation and a section, by reference to which all the parts of this simple and excellent device may be readily understood.

A represents the husk-frame to which the bridge-tree, B, is pivoted in the usual manner; the end, opposite the pivoted end, being raised or lowered by the adjusting screw, C, as hitherto; but instead of placing the step on these bridge-trees, as has hitherto been practiced, the bridge-tree, B, is placed lower down than in the old method, and the step support, D, itself supported from the bridge-tree by the rod, F, is provided, as shown in the engravings.

The rod, F, is pivoted to the bridge-tree, as shown in the engravings, and engages with the broad lateral arms, I, on the interior of the support, D, the top of the rod, F, being formed into a crutch, as shown in Fig. 2.

The lateral arms, I, Figs. 1 and 2, extend across to vertical guide-plates, K, which being pressed against the arms by means of the screws, L, adjust the step support so that it shall move in a line exactly perpendicular to the face of the bed-stone, and also prevent rattling or clattering against the edges of the plates, G, through which the step support passes.

The step support is preferably made tubular, as represented in the engravings, and the step, E, of any approved construction, is placed at the top and held by screws, as shown in Fig. 2, or in any other suitable manner.

It will be seen that perfect truth in the perpendicular action of the spindle is thus secured.

Patented, through the Scientific American Patent Agency, February 1, 1870, by John Russell, of Round Prairie, Missouri. See advertisement in another column.

Fig. 1

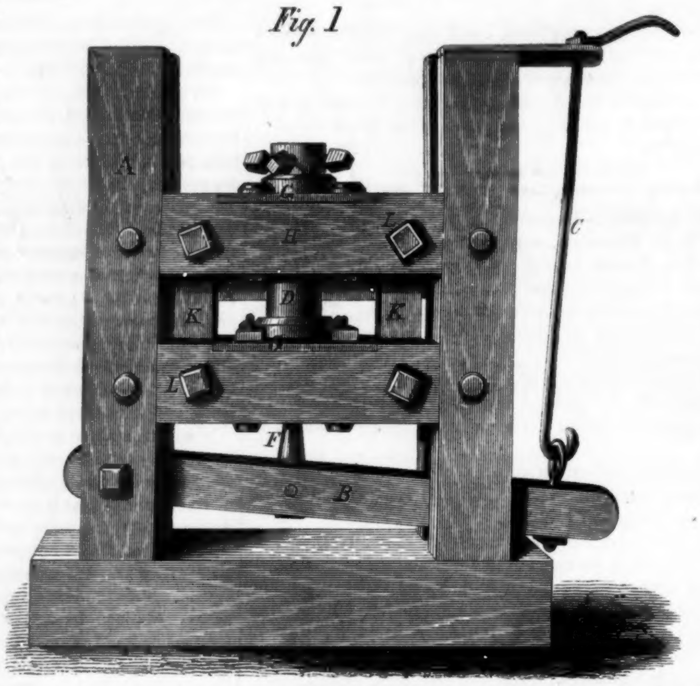
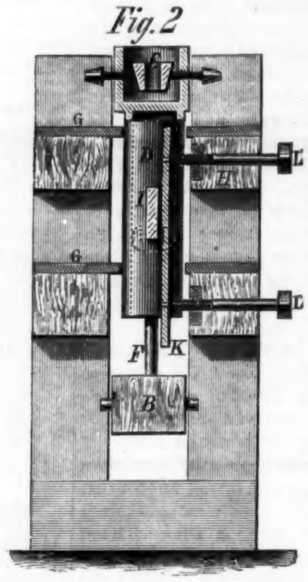


Fig. 2



RUSSELL'S SUPPORT FOR MILL SPINDLES.

Improved Form of Ax Blank.

This invention consists in rolling a bar of iron into the shape of a continuous series of blanks for ax heads, the fiber of the iron running lengthwise of the bar and ax head.

The blanks are formed by a pair of rolls provided with a groove or grooves, the contour of which corresponds to the desired form of the ax heads.

Fig. 2 represents a longitudinal section and plan view of the blank of a single-bitted ax as it comes from the rolls, and also a section of the blank ready for the insertion of the bit.

Fig. 1 is a section of a blank of a double-bitted ax as it comes from the rolls, and also a section of the blank prepared for the insertion of the bit.

A, Fig. 2, represents the poll of the ax and B the portions destined to form the eye, and C the eye.

Instead of the thick portion at A, Fig. 2, which forms the poll of the finished ax, the blank for a double-bitted ax is formed as at A, Fig. 1, so that when the two halves are bent together for the insertion of the steel, the junction at A holds them in position until the first steel is inserted and welded. The junction at A being then severed, the second steel is inserted, the first weld holding the parts in place during the latter operation.

The advantages of this method will be readily seen and appreciated by manufacturers of axes. Blanks thus formed can be readily bent into the form desired, will draw out more readily under the hammer, and are not liable to crack in the eye of the ax.

A common way of forming the blanks, is to take the ordinary sized bar, say 3 × ½, or other suitable size, for the kind of ax required, and cut it into lengths of say 7 inches, so that the pieces to start with are 3 inches wide, 7 inches long, and ½ of an inch thick.

These pieces are placed in a furnace and heated to nearly a welding heat. This heating is very irregular, causing the loss of many pieces in pressing and bending. The pieces are then taken from the furnace and one end placed between dies formed on rolls that revolve only half way round.

After pressing one end under the dies the piece is turned, and the other end pressed under, thus forming the ax blank. In this operation, the blanks are never made exact; they may run heavy or light on the edge which forms the eye, one side being thick and the other side thin. One end may be hotter than the other and therefore spread more when the pressure comes on it, so that when bent it necessitates more labor with the hammer.

Another method is to forge the blanks. There is also another way—"rolling them"—which has been patented. In this method the bars are welded into such a shape that when two pieces are cut or sawed off they form the ax blank. In this method two welds are required, and the fiber runs crosswise of the ax; while in the method of Mr. Jope there is a *solid poll, only one weld*, and the fiber runs *lengthwise*, as it should in all axes, so that in chopping wood or using the ax, the blow comes on the end of the fiber and not on the sides, thus weakening the ax. Moreover the iron can be rolled at a uniform heat, and every blank will be exactly like its fellow with each blank cut nearly, or altogether, off to the length required. Thus much time and labor will be saved in subsequent operations, and the blanks can be rolled out nearly at the same cost as ordinary bar iron, the saving in running machinery and in waste of material would seem to render this a valuable improvement.

Patented October 12, 1869, by G. W. Jope and Wm. Bunton, Pittsburgh, Pa.

Fig. 1

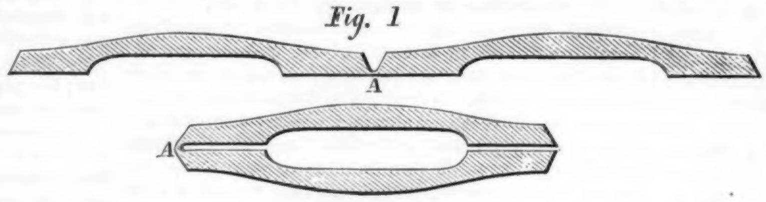
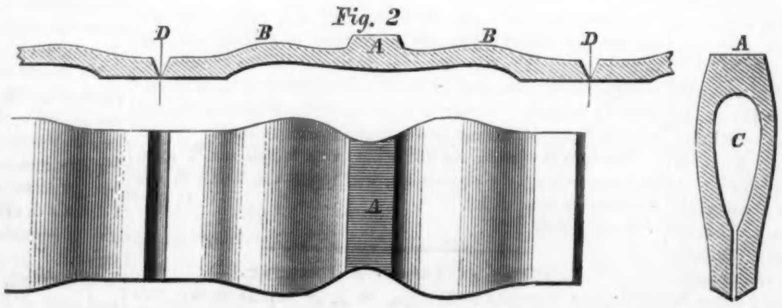


Fig. 2



JOPE'S NEW METHOD OF ROLLING AX BLANKS

Natural and Artificial Mechanism.

In every department of mechanics, working models have deceived the inventors. The laws that regulate motion differ widely from those that regulate chemical action. That which is true of an atom in its properties of combination, is true of any number of atoms—from the smallest experiment to one managed on the most extensive scale. The chemist in his laboratory, from his test tube and crucible, can give you the formula for any imaginable quantity. Not so with the machinist. His disturbing influences are not the atomic relations of the elements of his material. For construction, he has to use substances such as nature and art furnish, and subject these to the action of external forces which increase rapidly with their size and velocity. It is exceedingly difficult to estimate the amount of these forces; and as nature arranges the fibers of each plant, and machinery of each animal, after a different plan, to meet the forces that are opposed to it; so must the mechanic plan all his arrangements, from the smallest machine to the most stupendous engine, to harmonize with the laws of matter.

In whatever movement that is attempted in the animal construction, there is a concentration of forces directed through appropriate apparatus sufficient for the intended result. The nature of the force, its amount, and the magnitude of the result have such a relation to each other, and vary so much in different animals, that the instruments, by which the force is made effective, are necessarily varied in form and complexity. In all their relations to the end, however, they are perfect.

When man attempts to construct a boat—which we will introduce as an example of adapting means to the end—and this boat is to be driven by forces developed within itself; and if along with capacity for freight he wishes to insure great speed, he experiments on various forms of hulls and kinds of propellers. Every line from cutwater to sternpost is duly considered. The parting of the water at the bow, and the closing at the stern, with all the varieties of displacement at different speeds, enter into the investigation. Calculations, running from the tub-shaped argosies of olden time down to the sharp models of the present day, are made with the greatest seeming accuracy. Paddle wheels and submerged propellers are next considered; and all the science of the scholar, and experience of the practical boatman, are brought to aid in the choice, and to determine the form. Tables of experiments are examined. With certain models results have been obtained, varying with the propeller used. Every particular of power, number of revolutions, weight carried, conditions of temperature, wind, and water, are noticed, and data obtained, it is supposed, that will warrant the construction of another boat of greater magnitude, with the same relative proportions from which results may be expected, corresponding with the increase of size. The boat is constructed, and falls far short of the anticipation. The proportions between the inertia of the water and model boat are not the same as between the water and the larger vessel; yet the latter is but the magnified counterpart of the former, with the disadvantage of available power not being equal to in crease of weight. A small boat may be driven with great velocity, without its propellers scarcely making any wake in the water, after the manner of insects skipping over the surface of pools; for the resistance of the water is great, compared with the extent of surface of the moving body applied to it, and the weight to be overcome. A large vessel cannot carry such a proportionate extent of propelling surface, and here the calculations founded on the results of a model fail. If the amount called for by the enlarged plan were practicable, that is, if material were light enough, and sufficiently strong to carry it out, still there would be a disproportion in results. With the increased resistance of the water that must be rapidly displaced by an immense body urged with great velocity through it, and the water, to which the propeller is applied, being no more resisting for the larger boat than for the model, a velocity must be given to the propeller, to make the inertia of the water, on which it strikes, sufficient to overcome the resistance of the advance of the boat; and this to a degree proportionate to the speed to be attained. It will be seen at this view, that difficulties are to be encountered that make experiments on boat-models of less importance than is generally supposed. Although large steamers have made greater speed than small, the rate is far from being in direct proportion to size and power of engine. A very small boat, one that can be carried on a two-horse wagon—engine, boilers, and all—will easily make eight miles an hour. The *Great Eastern* cannot make three times that speed. Until the whole moving apparatus of one of these large vessels bears the same relation to its weight, and submerged size and power, that the tail and muscles do to the swiftest fish, rapid movements through the water by boats must be an imperfect attempt to rival the machinery of nature.—*Beecher's Magazine.*

A London chemist—Dr. Andrews—has announced a discovery which, if confirmed, is of the first importance, namely, that the gaseous and liquid state of matter are continuous. His experiments have chiefly been made upon carbonic acid, confined in fine glass tubes, and subjected to various pressures up to that of 110 atmospheres; they show that from carbonic acid as a perfect gas, to carbonic acid as a perfect liquid, the transition may be accomplished as a continuous process, and that the gas and liquid are only distinct stages of a long series of continuous physical changes.

Razor Paste.—Take putty powder 1 oz., oxalic acid ½ oz., and honey enough to mix with these so as to make a stiff paste. Apply it to the strop, and wrap the remainder in tin foil.

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NEW YORK, SATURDAY, MARCH 19, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

PROPOSED SALE OF THE YOSEMITE VALLEY.

The proposition to sell a portion of the Yosemite valley to certain persons, as pre-emptors of the land, is again before Congress, and has been reported upon favorably by the committee appointed to consider the subject. As this valley belongs to the people of the United States, the question appears to be between two squatters and all the rest of the inhabitants as to who shall finally obtain control of the grandest scenery on the face of the earth. It is a matter of so much importance that we think proper to devote some attention to it, for the sake of entering an earnest protest against any sale or cession of the territory to private speculators.

The valley of Yosemite was discovered in 1851, by a party of white men hunting for stock which the Indians had stolen. They recovered a portion of the stolen property, and returned with marvelous accounts of the extraordinary scenery of the new region which they had found about midway between the summit and the base of the Sierra Nevada mountains. Notwithstanding the enticing character of these accounts very few persons ventured into the valley, on account of the difficulty of access, and the distance from any base of supplies.

Mr. Hutchings, one of the present claimants was one of the first to explore the place, and, in 1859, J. C. Lamon moved into the valley and settled on the land now claimed by him. According to all accounts Mr. Lamon appears to be a *bona fide* settler, entitled to compensation in case of removal. He has resided on his claim for more than ten years, and has been engaged in setting out fruit trees and raising vegetables, but has never kept an hotel or house of entertainment.

On the 13th of June, 1864, Congress passed a law by which the United States gave to the State of California the Yosemite Valley and the land within one mile of the walls thereof, and the Mariposa Grove of Big Trees, to be held in trust forever as a pleasure resort for the people of the United States. The State of California accepted the trust in the spirit in which it was given, and at once appointed Commissioners to make surveys and lay out suitable roads for the accommodation of visitors. Two of the Commissioners are well known in the East—they are Professor J. D. Whitney, the eminent geologist, and Mr. Frederick Law Olmsted, of the Central and Prospect Parks. These gentlemen made elaborate reports to the Legislature as to the work to be done and the proper way to begin it. Galen Clark, who lives near the valley, was appointed its guardian by the Commissioners, and all expenses were paid by the State. In 1864, while the bill ceding the valley to California was pending, Mr. Hutchings bought out some parties who had built rude huts, and has since put up a frame hotel, with accommodations for thirty guests. His claim is situated about half way up the valley, and extending entirely across it. The Commissioners tried to compromise with these claimants by giving them leases of the premises for ten years at a merely nominal rent. The offer was rejected, and suits of ejectment were commenced, but they have never been pushed to final judgment, as the parties were anxious to procure legislative interference. The whole question finally came before the California Legislature, and that body, in the most unaccountable manner, passed an act giving each claimant one hundred and sixty acres of land in the valley, providing the Congress of the United States would give its assent—such assent being necessary to a clear title. The Governor of the State, to his credit be it said, vetoed the bill, but the Legislature, renowned in the history of the State for its venality, re-enacted it over his veto; and in this manner the claimants find their way to Washington, and a desperate struggle will be made to confirm the spoliation so disreputably begun in the West.

The land was first surveyed in pursuance of the act ceding it to the State. No portion of it was ever declared open to preemption; all that the Government promises to squatters is, that, in case the land comes into market, actual settlers shall have the first claim to buy it. This land never was in the market, and it was never intended to sell any portion of it.

There is no doubt that Mr. Lamon, who went to the valley and tilled the soil as an actual settler, is entitled to compensation. All he at one time asked was $12,000, and $8,000 more would satisfy the claims of the other parties.

It would be infinitely better to pay the $20,000 and eject these persons than to give them the best portions of the valley, and thus open it to the entrance of the worst class of speculators, gamblers, and disreputable characters. What would the inhabitants of Europe say if the valley of Chamouni were offered for sale, or if the Zermatt and Monte Rosa were in the market? Doubtless the same that must be said of us if we permit the Yosemite to pass into private hands.

The Yosemite valley is said to afford the finest scenery known to man. It is only accessible at the lower end by two trails that abruptly descend 2,000 feet. The walls for six miles are nearly vertical, and in some places are a mile in hight, and are composed of pure white granite. But the crowning glory of the place is the Yosemite Fall, which in three leaps falls 2,634 feet. There is no water-fall in the world to compare with this. Other falls are, the Bridal Veil, 940 feet; Vernal, 350 feet; Nevada, 700 feet; and Royal Arch Fall, 1,800 feet. The valley is only a mile and a half wide at the broadest part, and in most places is less than half a mile. This adds to the apparent hight of the perpendicular walls on either side. If private individuals were to obtain control of all these wonders, the inconvenience to the public, and the impositions to which all travelers would be subjected, would be insupportable.

The original law of Congress granting the valley to the people of the United States as a pleasure ground for their use forever, was one of the most enlightened acts of legislation on record, and it would be better to stand by the original bill. If the State of California is weary of the trust, then let Commissioners be appointed by Congress, to whom shall be confided the important responsibility; under no circumstances and on no pretense, ought the property to pass into private hands.

CO-OPERATION AMONG INVENTORS.

We have recently had suggested to us by sanguine correspondents, that a grand coöperative scheme among inventors to establish a central bureau or college of invention would be of great public benefit. This institution would, according to the plan proposed, receive its endowment from contributions of inventors to furnish a building and apparatus, and remunerate a paid court of experts to test and decide upon the merits of inventions.

This scheme might perhaps seem at first sight to have some merit. It has, however, the great drawback that it is wholly impracticable.

The inducement relied upon to obtain contributions, is a future personal benefit to the contributor. This would not be sufficient unless the donor were guaranteed, or supposed himself to be guaranteed the promised benefit. At best, the benefit would be contingent upon his making an invention of such doubtful value that he himself could not decide upon its merits; or that those engaged in the business or department of industry in which the improvement is proposed and to whom he can have access, are unable to decide. An invention, the value of which is so doubtful as this, can be safely said to have no value.

But supposing that every invention may possess more or less merit, and that each inventor could be guaranteed that upon sending a model or drawings and specifications to the "Inventors' Coöperative Central Bureau," an examination would be duly made, and a report with reasons for the decision arrived at duly forwarded to him; how few would accept such a decision as final, provided it was adverse?

In our own practice as Patent Solicitors, we often meet with men who, when we pronounce their devices neither new nor useful, are offended and straightway make application to some one less scrupulous, who encourages them to proceed, takes his fee, and does *not* get them a patent; or, if they get a patent, it is done by so cutting down claims as to render the patent not worth the paper upon which it is printed.

Commissioner Fisher, in his last report, says most truly, that inventors "are lacking in legal knowledge. They desire a cheap solicitor, and do not know how to choose a good one. They are pleased with the parchment and the seal, and are not themselves able to judge of the value or scope of the grant." Thus they fall into the hands of sharks, who, as Commissioner Fisher again says most forcibly, "are more desirous of obtaining a patent of any kind than one which will be of any value to their clients."

One of our correspondents has anticipated such an emergency, and suggests a higher court of experts, to whom appeals can be made, and whose judgment shall be final. But alas for the weakness of human judgment! Those not satisfied by the decision of an inferior court would not be any more satisfied with the opinion of the court of appeal, provided it should also decide adversely; and so discontent and murmuring would arise, and instead of the anticipated coöperation there would be breaking up into factions, each of which in its endeavor to get control of the institution would not hesitate to pull down a stone from its walls, until final ruin would wind up the entire concern. Moreover, this method of testing inventions would be, in the average, far more expensive than for each inventor to test his own invention in connection with those qualified to pass upon its merits; and it would be attended with such delays and annoyances as would render it at once and permanently unpopular.

The only way in which money can be obtained for a benevolent object without compromising success is as a free gift, with no contingent personal advantage pledged to the donor; and in most cases it is better that even all control over funds thus donated should pass from the givers and become vested in responsible trustees. In this way colleges and universities are endowed, and the great difference between such gifts and those by which the funds for the Inventors' Bureau are proposed to be obtained, is that they are free gifts for the good of others, not gifts contingent on some personal good to be subsequently received.

But while we deem this scheme of coöperation as utterly impracticable, there is a way in which inventors and mechanics may coöperate with universal benefit. This scheme is set forth in an article on page 345, Vol. XIX., in which we advocated the establishment of a national collection of new inventions, to be placed on view so that all who wish may examine and inform himself upon any point by the payment of a small fee. Such an institution would be of present and permanent value, and it might easily be established by a properly organized association of inventors.

THE USE OF SALT IN AGRICULTURE.

Whether common salt is of any value to plants, is still a mooted question, and one that finds advocates on both sides. The luxuriant growth of marsh meadow grass is taken as a proof that salt water must be favorable, and farmers attempt to imitate this state of things by putting salt on the grass without reflecting that all other conditions are omitted in the experiment. They are generally astonished to find that the grass is killed, instead of being promoted in its growth. It is a remarkable fact, that this same salt marsh grass, on analysis, is found to contain very little soda, but to have its full complement of potash. This would seem to indicate that it had grown in spite of the salt, rather than in consequence of it. According to some recent researches, made in France, potash is a hundred times more valuable to plants than soda. It is true, that small quantities of soda have been found in plants, but, generally, under circumstances that seem to point to its accidental rather than essential presence. Direct experiments have shown that salt is injurious to tobacco and to the sugar beet. An examination of the plants growing near salt springs and salt marshes, shows that the vegetation is of a limited and peculiar character. All of these observations point to the conclusion, that the direct use of salt, as an artificial fertilizer, is only applicable to such plants as grow on the sea shore, or near salt springs, and not at all to the usual grass and cereals of our farms. The whole system of manuring farms is based upon the principle to restore to the soil the constituents that are removed by the crops. As the crops carry away no soda, it follows that none is necessary to their growth. There is another objection to the use of common salt, and that is the chlorine contained in it. This element is decidedly injurious, as has been shown by the experiments of Wolf and others. Public opinion in Germany has set so strongly against the use of salt, that, in the famous mines of Stassfurt, where vast quantities of artificial fertilizers are manufactured, the exclusion of chloride of sodium, or common salt, is now considered necessary, and the value of a manure is made to depend upon its percentage of potash.

We have been led to make these observations after perusal of an able lecture on "Salt and its uses in Agriculture," by Professor Gossmann, of the Mass. Agricultural College. Dr. Gossmann concludes his remarks as follows: "The safest and cheapest way of supplying salt to your farm lands, if at all desirable, is to feed it to your live stock, for natural channels of distribution are always the best."

SOMETHING ABOUT GASES.

The most attenuated condition of matter known to man is that of a gas. It is true that there is supposed to exist a kind of matter pervading not only all the inter-planetary regions, but the inter-molecular spaces of all bodies, whether solid, liquid, or gaseous. The name given to this hypothetical state of matter is ether, and if its existence be granted, its tenuity is so great that it has no sensible weight. Its existence is only a matter of inference.

The satisfactory manner in which the hypothesis of the existence of such an ether accounts for the transmission of light and heat, has led to its very general adoption in modern works on physics; and there seems nothing improbable in the idea that there may be states of matter, the density of which, when compared to the lightest of known gases—hydrogen—should be even less than that of hydrogen, as compared with mercury, the heaviest fluid known to exist at ordinary temperatures.

Admitting this, does not, however, relieve us from the consideration of other difficulties pertaining to the hypothesis of an etherial inter-planetary medium. If such a medium exists, and if, as has been surmised, this medium be simply ordinary matter attenuated to such a degree as we have above described, it must possess the same physical properties as belong to gases.

Such inquiries are, however, speculative, and the object of the present article being to discuss in a popular manner some of the leading physical characteristics of gaseous bodies, we will turn our attention from hypotheses to demonstrated facts.

Gaseous bodies were formerly supposed to be of two kinds, permanently elastic gases and vapors, or such as were reducible, like steam, to the liquid form, by the loss of heat

and the increase of pressure. Professor Faraday, however in a series of magnificent experiments, proved that such a distinction had no foundation whatever. He not only liquefied but solidified many gases that had been deemed permanently elastic, and these experiments have been repeated and extended by other investigators, until the belief now obtains that no particular state, whether solid, liquid, or gaseous, is specific to any kind of matter, and that these states depend solely on the relations of the molecules of bodies to heat.

The converse of these experiments, that is, the changing of solids and liquids to a gaseous state, has been performed with nearly every known solid or liquid, and the colors which these gases impart to the blow-pipe flame, and the colors and positions of the peculiar lines or bars, formed by passing the light of such colored flames through a prism, and throwing the beam of refracted light upon a screen, have been found to indicate the nature of different substances with the utmost delicacy. This method of determining the presence of substances by the examination of the effect which the presence of their vapors produces upon the light emitted by burning alcohol, gas, solar light, etc., is called spectrum analysis; and the instrument employed in making such researches is called the spectroscope.

An entirely new department of chemistry has grown out of the extension of the use of the spectroscope to the examination of the light emitted by the heavenly bodies, and such examinations have led to the belief that the elementary substances as we know them by close examination in the chemical laboratory, are distributed throughout the universe.

One of the most prominent physical characteristics of gases, is their great elasticity. It is this property upon which the usefulness of steam as a motive power in a very great measure depends. In fact, gases and non-viscous liquids are the only perfectly elastic bodies.

The theory of the elasticity of gases is comprised in what is known as *Mariotte's Law*, which is "that in an elastic fluid subjected to compression, and kept at a constant temperature, the product of the pressure and the volume is a constant quantity;" or, in other words, the volume is inversely proportional to the pressure. This law does not, however, hold good for all pressures, nor for all gases. In those most difficult to liquefy, as oxygen, nitrogen, or their mixture in atmospheric air, etc., the law holds good, but in such gases as chlorine, steam, and others that can be liquefied under such pressure as can be practically brought to bear upon them, departures from the law are observable, increasing as the gases approach liquefaction. Such variations are, however, of little practical importance, and the law as enunciated is sufficient for all ordinary purposes of computation.

Another prominent characteristic of gaseous bodies is their affinity for water. Water absorbs all gases to a greater or less degree. The colder the water and the greater the pressure the more gas will be absorbed, and *vice versa*; but the volumes of different gases which water and other liquids will absorb, vary greatly. Gases are also absorbable by solids to a large extent, wood charcoal and animal charcoal being some of the most powerful solid absorbents.

But perhaps the most remarkable property of gases is that which gives rise to what is called diffusion. The heaviest gases when placed in contact with the lightest, do not remain separate like oil and water, but mingle and diffuse each through the other in defiance of gravity. This even takes place when the gases are separated by a porous diaphragm. A common experiment, illustrating this truth, is to fill a glass jar with carbonic acid and invert over it a jar filled with hydrogen, which is twenty-two times lighter than carbonic acid. In a very short time equal quantities of both gases will be found in each jar. This has led to the enunciation of the law that every gas comports itself toward every other gas as though it were a vacuum. Thus the presence of dry air in a vessel does not prevent, though it will somewhat retard the entrance of any other gas. As much of the latter will enter with the air present as would be the case if the air were exhausted.

Regnault was the first to prove that although the expansion of each gas is nearly equal for equal increments of heat when rising from different temperatures, all gases do not expand alike for a given increase of heat. We have said the expansion of each gas is nearly equal for equal increments of heat. For practical purposes this expansion may be considered as absolutely equal, as the differences are but slight, and only determinable by accurate experiment. The most important application of this law of expansion, is made in the steam engine, when steam is used expansively.

The distinction between vapors and gases has been, as we have said, virtually abandoned; but the term vapor is still commonly applied to such gases as are most readily reduced to the liquid state. Though it may seem to some an innovation to talk of steam as a gas, yet it is a gas, possessing the physical characteristics of all other gases, and must be considered as such to attain a perfect comprehension of its action as a motive power.

NEW MECHANICAL MOVEMENTS.

Perhaps no department of study is more improving to the inventive faculty than the study of mechanical movements—those minor machines which, combined, produce the various motions to be found in complicated machinery.

The mechanical powers, as they are called—*i.e.*, the lever, the inclined plane, the wedge, the screw, the wheel and axle, and the flexible band or rope—may properly be reduced to three—the lever, the inclined plane, and the band. For the wedge and screw are only modifications of the inclined plane, while the wheel and axle is a modification of the lever.

These three fundamental elements are therefore the basis of all mechanical movements, that is, combinations to produce certain movements of parts of machines. There are already a great number of these in use, and a still larger number which have never been much used, but there is little doubt that there are a great many more which are possible. The search for these gives rise to some of the most beautiful mechanical problems, as well as some of the most difficult. The solution of one of these was given on page 372, Vol. XVIII.

We propose now to enunciate a few such problems upon which our inventors may try their skill, premising that, as in the higher mathematics, the solution of a problem demonstrates its impossibility if it be impossible; so, if it can be satisfactorily shown that the problems here given are any of them impossible, that shall be considered as a proper solution.

Problem 1.—Required to convert the rotary motion of a pulley into a horizontal intermittent rectilinear motion, first in one direction and then in the opposite direction, without the use of a pitman, pulley, toothed wheel, cam, cam groove in a pulley, or a flexible band, the first rotary motion to be constant and uniform. In other words, let it be required to move a piece of metal, wood, or other material, to a certain point where it shall pause, and then again move on a certain distance and again pause, and so on successively as far as desired, when it shall return to the point from which it originally started in the same intermittent manner and under the conditions above specified.

Problem 2.—Required to produce a variable rotary motion in a shaft driven directly by a belt from a pulley having a uniform constant rotary motion, without the use of anything but the one belt and the two pulleys; no cone pulleys or their equivalent to be allowed. All the motions to be continuous and in the same direction.

Problem 3.—From a reciprocating body to communicate reciprocation to another body, so that the second shall make four reciprocating movements for every reciprocation of the first; the motions of these bodies to be in lines parallel to each other, and the pieces to be connected by only three moving parts, which parts shall be neither wheels nor pulleys of any kind, and no inclined planes, cams, belts, or flexible cords, cranks, or bell cranks, to be allowed, and no radial motion from a fixed center in any piece employed.

This will do for the present. Some of these problems are, perhaps, too difficult for a beginning, but they are all capable of solution. It is not at all improbable that the effort to solve them will lead to some useful inventions. The author of them made two useful applications of ideas suggested while attempting their solution.

The solutions offered may be given in simple diagrams accompanied with such description as may be necessary.

PROPOSED PLAN FOR PUBLISHING PATENT OFFICE SPECIFICATIONS AND DRAWINGS.

The speech of Mr. Jenckes, of Rhode Island, in the House of Representatives, on the 9th inst., in support of the House joint resolution providing for the publication of the specifications and drawings of the Patent Office, and the subsequent debate upon the subject, has placed the salient features of the plan in such a light that the public generally may comprehend its advantages.

It is proposed to abandon the publication and distribution of the annual reports as they are now published, and instead to place in the capital of every State, and in every city where a circuit Court of the United States is held, if it be not held in the capital, a complete record of the transactions of the Patent Office; the specifications in full and the drawings in full. Then the inventor has simply to take rail or boat, and visit the capital of his State, and he will have the same means of investigating what are the inventions of the country as if he came to Washington in person.

It is also proposed to furnish an equally perfect record to each public library in any part of the United States, which shall pay for its uniform binding and its transportation to the locality where the library is situated.

It is further intended to make this distribution weekly, so that the latest information relative to patents may be accessible to the entire country.

The disadvantages of the present system are great. It is confessedly expensive, incomplete, inaccurate, and inadequate to meet the needs of inventors.

The advantages of the new system are as obvious as the disadvantages of the old. The distribution being not a matter of favor, as now, the filed drawings and specifications will form a complete as well as an accurate and reliable record. Under the present system the distribution is very imperfect, so much so that complete sets of the reports since their publication in 1844, are rare outside of Government Departments, though not so much so as to justify Mr. Banks' statement in the debate referred to. Mr. Banks said that "Of all the million volumes that have been distributed, I do not believe that there is within the United States in the hands of any private citizen, unless he have some special Government advantages, a complete set of this encyclopedia of inventions. The chairman of the Committee on Printing tells me that there is not in the Patent Office itself, nor in the Library of Congress even, a complete set; and I do not believe that such a set exists in any one of the one hundred and four principal public libraries of the United States, which contain ten thousand volumes and upward. Now what a senseless practice is the distribution of this work, at a cost of $235,000 a year, when the value of it is greatly impaired by the manner in which it is distributed."

We have a complete set of these reports, and they are of great service to us. They are constantly sought by large numbers of persons interested, who daily visit our office to consult them. It is true, however, that only complete sets are of much assistance, and that the drawings are often so defective in their lettering as to mislead; and they are altogether too meager to give such information as will form a basis for accurate judgment.

It is claimed that the new system will decrease the expenses of the Patent Office for printing $100,000 per annum, and it will also reduce the expenses of those who now have to go to Washington to pursue their investigations by requiring them only to journey a short distance to obtain the necessary information.

It is thought this plan would increase the confidence of capitalists and make them more ready to invest in really new and useful inventions, as they would easily be able to verify the value of an invention, so far as novelty is an element of value.

By means of the art of photo-lithography the drawings can be reproduced of half the present regulation size at an estimated cost of one dollar and fifty cents per hundred, and although the bill, in its present form, provides only for the publication of specifications and drawings after the publication of the report of 1868, it is estimated that all the drawings and specifications issued prior to 1870 might be reproduced is 300 volumes at a cost of $200,000.

Mr. Jenckes performed an act of injustice in his speech toward honest and honorable patent solicitors, in making no distinction between them and such as do not identify themselves with the interests of their clients. No one knows better than Mr. Jenckes that this is unjust, and it is probable that his zeal in the support of his measure, betrayed him into an unguarded expression.

We heartily advocate the passage of this resolution; but we would have the plan extended to the publication of the specifications and drawings of all the patents which have been issued up to the present date; and it ought also to be amended so as to admit of the purchase at cost by such parties as are willing to pay for it in advance of publication. Many copies could thus be sold without increasing the cost to the Government, and a much wider circulation be given to them.

CONGRESS EXTENDING PATENTS.

In the House of Representatives on Friday, March 11, the following measures concerning patents were enacted:

Reports were made from the Committee on Patents by Mr. Jenckes adversely on the following applications:

For extension of patents of J. Carhart, of New York, and of Charles A. Pitcher, for the manufacture of brooms.

Bills were reported from the same committee allowing applications for the extension of patents as follows:

By Mr. Jenckes—Patent of Walter Hunt for the manufacture of paper collars. Passed.

By Mr. Calkin—Patent of Timothy D. Jackson for improved annunciator or bell-telegraph for hotels, etc. Passed.

By Mr. Myers—Patent of Thomas Thompson for improved machine for folding paper. Passed.

Also, patent of William Montstown for improvement in revolving fire-arms. Passed.

Also, patent of John Edgar for self-regulating wind wheels. Passed.

Also, patent of Tobias J. Kindleberger for improvement in cider mills. Passed.

By Mr. Calkin—Patent of John Young for improved washing and wringing machine. Passed.

By Mr. Johnson—Patent of Jonathan Haines, for harvester or header.

After discussion by Messrs. Johnson and Cullom in support of the bill, and by Mr. Tanner in opposition to it, the bill was passed.

By Mr. Jenckes—Patent of Augustus R. Moen for improvement in the construction of basement, cellar, conduit, and other like walls, so as to render them impervious to water. Passed.

Also, patent of Robert Burns Goodyear for improvement in power looms.

Pending its consideration the morning hour expired, and the bill went over to the morning hour next Friday.

If this kind of special legislation by Congress is to continue, the statues relating to extension of patents might as well be repealed. Of what use is it to absorb the time of the Commissioner, who knows what he is about, in the examination of applications for extension, when a successful appeal from his decision can be made to Congress through the aid of expert lobbymen, thus practically taking the power of granting or refusing extensions out of the Commissioner's hands? We have always opposed this sort of legislation.

To Clean Paint.—There is a very simple method to clean paint that has become dirty, and, if our housewives should adopt it, it would save them a great deal of trouble. Provide a plate with some of the best whiting to be had, and have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry; then take as much whiting as will adhere to it, apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which wash the part well with clean water, rubbing it dry with a soft chamois. Paint thus cleaned looks as well as when first laid on, without any injury to the most delicate colors. It is far better than using soap, and does not require more than half the time and labor.

Picture frames or frames for loooking-glasses may be easily coated with bronze by a thin plate of liquid quartz upon which a fine bronze powder is dusted.

APPLICATIONS FOR EXTENSION OF PATENTS.

CASE FOR SEWING MACHINES.—William O. Grover, of Boston, Mass., has applied for an extension of the above patent. Day of hearing May 11 1870.

MAKING MOLDS FOR CASTINGS.—Robert Jobson, of Wordsley, England, has applied for an extension of the above patent. Day of hearing May 11, 1870.

OPERATING STEAM STAMPS.—Adelia E. Ball and Edwin P. Ball, of Chicopee, Mass., administrators of William Ball, deceased, have petitioned for an extension of the above patent. Day of hearing May 11, 1870.

REAPING MACHINE.—William C. Martin, administrator of Jacob J. Mann, deceased, and Henry F. Mann, of Pittsburgh, Pa., have petitioned for the extension of the above patent. Day of hearing May 18, 1870.

NAIL MACHINE.—Daniel Dodge, Keeseville, N. Y., has applied for an extension of the above patent. Day of hearing May 18, 1870.

REGISTERS AND VENTILATORS.—Edward A. Tuttle, of Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing May 25, 1870.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

H. B., of Ky.—You are right in attributing the cracks in your boiler to unequal expansion, and also in the opinion that the boiler is unsafe. You do not say where the feed-water is admitted, but judging from your description we infer that it is at the bottom. If so, it is wrong. It ought to be carried in at a point opposite the middle of the upright flues. The water space between the inside and outside shells of the firebox is too contracted. Instead of five eighths of an inch space between these shells there should be three inches. You can alter the boiler to correct this error by taking out some of the flues, but of course you will thereby reduce your heating surface.

F. W. of N. Y.—There would have been no danger of explosion in the boiler of your steam heater if the water had gradually blown out of it under a pressure of 6 lbs. to the square inch; but it would under such circumstances be liable to injury from overheating, and so become weakened, and incapable of withstanding even that low pressure. You should be careful to regulate the draft so as not to get up more pressure than that of the head which supplies the feed water.

C. B., of Ky.—To find the area of induction pipe to steam engine cylinders, multiply the speed of piston in feet per minute by the square of the diameter of the cylinder in inches. Two one-hundredths of this product multiplied by 170 gives the area of cross section of the induction pipe in square inches. To find the inside diameter, divide the area of cross section by the decimal 0·7854, and extract the square roo of the quotient.

J. G. B., of Miss.—Variations in the temperature of the human body are strong indications of disease, either local or general. In a state of health the human body keeps about the same temperature under all circumstances. Even when a person feels very warm from violent exercise, the thermometer shows little change in the temperature of the blood, unless the functions of the body are disturbed.

S. C., of N. H.—We have investigated the matter of engines made with cylinders curved in the line of the bore, and find that to properly elucidate the subject it would be necessary to make engravings. The subject is not of sufficient importance to justify this. We understand the cylinders are bored by a tool sliding on curved ways, and driven by means of shafts with universal joints.

R. S., of Conn.—You will have no difficulty in keeping swans, if you have a small piece of water for them to swim in. Their food is the same as that of geese. They prefer to build their nests on a small secluded island, and such an island if it does not exist naturally is generally provided, and a small house for the young erected thereon.

W. R. B., of Ind.—There is no gas with which you could safely mingle a mixture of air and the vapor of gasoline to increase the light, unless, perhaps, it might be hydrogen. It has been claimed that hydrogen with gasoline vapor is better than air, but we have some doubts about it.

R. S., of Tenn.—Gallic acid and tannic acid are extracted from nut galls, barks, etc. They are very nearly alike in composition. Tannic acid is the principle contained in barks which acts upon the gelatin of raw hides to convert them into leather.

H. & G., of Pa.—We have already expressed our doubts of the safety of high pressure steam heating pipes, in contact with wood, and our belief in the safety of low steam pipes. We refer you to discussions on this subject in our last volume.

C. Q. E., of Wis.—You are right. There is nearly always a difference in the price of gold and silver coin in favor of the gold. That is, a ten-dollar greenback will buy more nearly ten silver dollars than ten dollars in gold.

W. J. Lobach, of Ky., and others.—We republished the recipe for recutting files by acids just as we found it recorded. We know nothing about it that we have not already given, and we do not believe in its efficiency.

T. D., of N. Y.—The drawing of the steam hammer you send us is not clear, and as we are unacquainted with the device, we cannot explain it.

H. G., of Minn.—The blistering of the silver coating in the process of electro-plating, probably results from too great power of battery.

D. J. W., Jr., of S. C.—The best thing to prevent guns from rusting is olive oil. It is well to stop the muzzle with a cork, or wooden plug.

J. G. W., of Ind.—The discovery you have made is not new. We are unable to say who made the same observation first.

R. T., of Texas—There are probably twenty processes for preserving meat in use; to which do you refer?

C. G. F., of Texas.—We shall be glad to hear from you on the subject of "Wooden Railroads."

W. H. G., of N. J.—The crystals you send are garnets of an inferior kind, and of no value.

T. F. M., of Pa.—You will find an answer to your query in another column.

J. K. S., of W. Va.—The subject of small cotton presses has been sufficiently discussed for the present. Your communication contains nothing additional to what we have published.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WATER WHEEL.—Samuel Martin, York, Pa.—This invention consists of certain improvements in turbine water wheels, tending to increase their efficiency.

EXPANSIBLE CORE FOR CASTING IRON, GLASS, ETC.—Anson Balding, Wheeling, W. Va.—This invention has for its object to enable the cores around which hollow articles are cast, to be contracted, after filling the mold, so as to facilitate the removal of the cores from within the casting.

DITCHER.—James Callihan, Baton Rouge, La.—This invention consists of an apparatus for digging a ditch and throwing up a levee at one and the same time; said apparatus being operated by steam engines, which it carries, and is drawn forward by a steam engine placed upon a separate truck, which carries a steam boiler for supplying all the engines with steam.

GLAZIER'S POINT DRIVER.—M. D. Converse, London, Ohio.—This invention relates to a semi-annular V-shaped chamber, in which the triangular points, used for setting glass, are placed, said chamber being shaped in conformity with the brads or points, and being combined with a feed spring that keeps the points at the spot where they are required for use, and with a slide and guide by and through which the points are driven, one by one, into the sash.

STUMP MACHINE.—J. Higgins, Friendship, N. Y.—This invention has for its object to furnish a simple and convenient machine for drawing stumps, and other purposes, where great weight is to be raised short distances.

COTTON-SEED PLANTER AND FERTILIZER DISTRIBUTOR.—Henry C. Harris, Fort Valley, Ga.—This invention has for its object to furnish a simple, convenient, reliable, and effective machine for planting cotton and other seed and for distributing guano and other fine fertilizers.

HAND CLOTHES WASHER.—Peter Falardo, Newark, N. J., and George H Snow, New Haven, Conn.—This invention has for its object to furnish a simple, convenient, and effective hand washing machine, with which the clothes will be washed by squeezing out the water from the clothes, which clothes are at once again wet by water from the machine.

WINDOW-SHADE HOLDER.—Edward J. Robinson, Syracuse, N. Y.—This invention has for its object to furnish an improved holder for that class of window shades that roll up from the bottom, which shall be simple in con, tion and convenient and effective in use, holding the shade securely in any position into which it may be adjusted.

CLOTHES WASHER.—Rev. F. M. English, Evansville, Ind.—This invention has for its object to furnish an improved machine, which shall be so constructed as to wash the clothes and heat the water in which they are washed, which will do its work thoroughly and well, and without injury to even the most delicate fabrics, and which may be used with equal facility for various other purposes.

SADDLE-GIRTHING ATTACHMENT.—Eugene Spedden, Astoria, Oregon.—This invention relates to improvements in appliances for girthing saddles to horses and other animals. It consists of the combination with the saddle and the girth, of a set of pulley blocks, cord, and cord-holding clamp, under such arrangements that the rider may increase or diminish the tension of the girth, while in the saddle, and accomplish the same more easily than in the common way, by reason of the advantage due to the use of the pulley blocks and cord. The adjustment may also be made while on the ground equally as well.

FERTILIZER SOWER.—T. J. West, Alfred Center, N. Y.—This invention relates to improvements in machines for sowing plaster, lime, ashes, manure, and all other fertilizing substances, and consists in an arrangement, on an axle, mounted on wheels, and provided with a tongue or other means for hitching horses, of a long V-shaped trough, with a longitudinal opening at the bottom, and having one side arranged on pivots to be oscillated for widening or narrowing the opening, in which trough is placed a reciprocating rod, actuated by cams on one of the wheels, and provided with pointed or saw-tooth-shaped agitators, propelling downward through the discharge opening, and provided with flanges, projecting from the sides, by which the lumps and clods of the fertilizing substance will be pulverized and caused to feed uniformly through the discharge opening.

BLANK BOOK.—George H. Reynolds, New York city.—This invention relates to a new method of binding blank books, and all other books which are to be used for a considerable length of time, and in which great strength and durability are the chief objects. The invention consists more particularly in a novel system of arranging an endless upright string for holding the strapping to the back of the book, and in the manner of disposing such string. The invention also consists in the use of transverse strings, which are applied to the outside of the strapping and interwoven with the afore-mentioned upright strings.

RATCHET AND PAWL.—John H. Durran, Aurora, Ill.—The object of this invention is to prevent the end of a pawl from working on the edge of a ratchet wheel, and from thereby wearing off the contiguous surfaces, while the pawl slips or works loose on the ratchet. The invention consists in providing the pawl with spring clamps by which it is held away from the edge of the ratchet wheel, so as not to wear the same.

STOVES AND GRATES.—E. C. Loud, Springfield, Mass.—This invention has for its object to so construct those stoves which have pivoted grates, that the swinging sides of the grates will be opposite to concave surfaces, so that the grate can be considerably agitated to disturb the fuel, without danger of dropping any coal into the ash box, and without danger of wedging coals or cinders between the edge of the grate and the stove frame.

SCROLL SAWING MACHINE.—G. M. Nickason, Ellenville, N. Y.—This invention relates to a new arrangement of a sliding frame for all kinds of reciprocating saws, so that the stroke allowed to the saw will be regulated by the thickness of the stuff to be sawed, to prevent useless waste of power. The invention also relates to a new application of adjustable spring power, for drawing the saw up, after each stroke.

COMBINATION TEAKETTLE.—G. Landrine, Jersey City, N. J.—This invention relates to a new and useful improvement in culinary utensils, and consists in combining with an ordinary teakettle a boiler and a steamer.

VEGETABLE CUTTER AND PEELER.—George Lutz, John Schultheis, and Michael Florentin, Newark, N. J.—This invention relates to a new vegetable cutter of that kind on which the articles are cut into long, narrow strips, and has for its object to provide an automatic peeling attachment and devices for adjusting the width and thickness of the strips cut.

HALTER.—Wm. M. Harris, Dixon, Ill.—This invention relates to improvements in halters for horses and other animals, and consists in connecting the tie strap to a ring suspended in a bight of the throat strap, and passing it through another ring in the bight of the lower nose strap, to slide freely in the latter ring, and in passing the bights or loops of both these straps through other rings before attaching the tie strap ring to them, the said rings being connected by a strap extending from the nose strap to the throat strap, under the center of the lower jaw; the said arrangement is designed to apply the restraining force of the tie strap on the nose, the throat, and top of the head, in a way to confine the head in a cramped position, calculated to temporarily disable the animal, when making efforts to escape.

PRESS FOR HAY, COTTON, AND OTHER SUBSTANCES.—Samuel Miller Mount Union, Pa.—This invention consists in double ratchet vertical hoisting bar applied to a press, which is operated by means of a lever and pawls, upon a rocking block.

FELTS.—Simon P. Siver, Danbury Ct.—This invention relates to improvements in felts for the manufacture of hats and other articles, and consists of an improved mode of producing felts with plain grounds, spotted with pieces of felt worked into the ground and differing from the same in color, to impart ornamental surfaces of variegated colors, of more permanence than when stamped on.

BARBERS' CHAIR.—Anthony Abel. New York city.—This invention relates to a new and useful improvement in the mode of raising and lowering the backs of barbers' and other chairs, whereby the adjustment as to hight is made in the most gentle and perfect manner.

ROCKING-HORSE.—Jesse A. Crandall, Brooklyn, N. Y.—This invention relates to a new rocking-horse, which is operated by means of springs concealed within the body, and by levers connecting the said springs with the pivoted supporting standards, or legs.

SAW GRINDING MACHINE.—George Walker, Middletown, N. Y.—This invention relates to improvements in machines for grinding long saws, and consists in an improved arrangement of apparatus for holding the saws while grinding, from springing under the action of the stone and the pusher or feeder. It also consists in an improved arrangement of the presser, for adjusting the plates to grind thinner towards the back; and it also consists in an improved automatic belt shifting apparatus.

CHURNS.—Floyd Hamblin, Madrid Springs, N. Y.—This invention relates to improvements in churns, and consists in the arrangement on a horizontal shaft, within a suitable case, of two or more rows of scoops or cup-shaped paddles in spiral lines in opposite directions around the shaft, and in connection therewith, a series of parallel cream-breaking bars, around the space above the paddles, against which bars the cream taken up by the paddles will be thrown with sufficient violence to break the small particles, whereby the formation of the butter will be accelerated. The object of the scoop or cup form of the paddles is, besides the advantage of the greater agitation they impart, to force the air into the cream in a greater measure, which is found in practice to be the case. And the object of the arrangement of the spiral lines in opposite directions is to impart a forcible movement of the cream from end to end of the churn, at the same time that the agitation due to the movement in the direction of the rotation is going on.

MILL STONE DRESS.—G. W. Loy, Nacogdoches, Texas.—This invention relates to improvements in mill stone dress, and has for its object to provide an arrangement of the furrows calculated to give greater draft in the bed stone from the center, about one third the distance to the skirt where, in the dress as commonly arranged, it is less than in the remaining portion, in which latter part are arranged the long furrows tangential or nearly so, to the eye of the stone, the direction from the said eye being opposed to the direction of motion of the running stone. The invention also comprises several modifications of the furrows and lands for adaptation to stones of different sizes, and for grinding different kinds of grain; also certain modifications of the furrows adapted for the bed stone when used as the runner. The upper stone is provided with a curved dress possessing some of the characteristics of the dress of the bed stone.

FAUCET.—Francis M. Bachman and Samuel Ricker, Fredericksburgh, Pa.—This invention has for its object to furnish an improved faucet, which shall be so constructed that it will entirely prevent leakage through it, and will enable the cask to be easily and quickly tapped without the loss of any of the liquid however great may be its pressure.

PROCESS FOR BLEACHING PAPER STOCK AND OTHER SIMILAR SUBSTANCES.—J. W. Goodwin, Petersburgh, Va.—The nature of this invention relates to improvements in bleaching paper stock, the object of which is to provide a means for accomplishing the same more quickly, in a better manner, and at less expense than can be done by the means at present in use. It consists in first submitting the substance to be bleached to the action of dilute nitric acid, well heated; second, boiling it in alkali in an open vessel; and finally submitting it to a bath of chloride of lime and sulphuric acid.

FLUE FOR DRY HOUSES.—Wiley B. Hix, Rome, Ga.—This invention has for its object to furnish an improved flue for use in a dry house for drying fruits, vegetables, lumber, and other substances, which shall be simple in construction and effective in operation, allowing the heat to be regulated and controlled at will.

POLE-ASCENDING APPARATUS.—George Fleming, New York city.—This invention relates to improvements in apparatus for ascending telegraph and other poles, and consists in an arrangement of rigging for hoisting masts up by the side of the poles, on the top of which masts are carried pulleys and cords, the latter hanging to the ground by which cords with pulley blocks are swung over the arms of the poles, through which pulley blocks the cords of platform are rove by which a person may be drawn up. The invention also consists in an improved rigging for attaching to the top of the pole for suspending the pulley for the platform for use when the pole has no arm at the top over which the cord can be swung.

TIRE UPSETTING MACHINE.—P. G. Ayres, Lindsay, Canada West.—This invention relates to improvements in machines for upsetting tire and metal bars, and has for its object to provide a simple and efficient apparatus, especially adapted for readily applying and removing the tires. The invention comprises a main bed of cast metal with a vertical fixed pillar, a sliding bed with another pillar, a pair of clamping dogs, a pair of supporting links for the pivots of the dogs, and an eccentric operating lever.

FLAT-IRON HEATER.—G. O. Honks, Addison, Vt.—This invention relates to a new and useful improvement in the mode of heating flat or smothing irons for ironing clothes, and consists in a rectangular-shaped box open at the bottom side with apertures for the admission of the flat irons, and with shutters for each arranged in a convenient manner.

CAR COUPLING.—Wm. J. Evans, Homer, Iowa.—This invention relates to new and useful improvements in car couplings, whereby a simple and efficient device may be obtained by which the cars may be coupled self-actingly when the said device has been properly set. The invention consists in the arrangement, with a coupling pin, having a vertical guide, of a hinged setting lever, for holding the pin above the opening for the link and for being tripped by the link to let the pin fall when the link has passed in. Also in an arrangement with the same of a balancing tongue to hold the links in a horizontal position so as to enter the mouth of the drawhead of an approaching car.

CAR WHEELS.—John N. Farrar, Pepperell, Mass.—This invention has for its object to furnish an improved wheel for steam and horse cars, engines, etc., which shall be strong and durable, and, at the same time, so constructed as to avoid the constant jarring and noise now attending railway traveling, and reducing the liability of accidents from breaking of wheels, etc., and also in a great degree preventing the battering of the ends of the rails by constant hammering of the car wheels.

BALANCED WATER ELEVATOR.—William L. Thomas, Wadsworth, Ohio.—This invention relates to a new and useful improvement in apparatus for elevating water, to be operated either by hand or other motive power, by means of which water may be elevated to any required hight, while the action of the working piston will be balanced.

PROGRESS OF AMERICAN INVENTION IN EUROPE.

The following Patents for American Inventions have recently been obtained in England through the Scientific American Patent Agency.

WATER AND GAS METER.—Joshua Mason, Paterson, N. J.—This meter consists of a cylinder provided with a plunger, and having a chamber at one end in which there is a valve chamber, containing a sliding valve, which consists of a rod with two circular disks or heads upon it, and a circular plate at one end. This plate is perforated to open communication between the valve chamber and the small chamber. The valve chamber is open at both ends and provided with three ports, communicating respectively with the supply pipe, the water passage to rear end of the cylinder and the discharge pipe. Two rods, parallel with each other, are attached to the plunger, and pass loosely through flanges or bent ends of two plates connected by a pin or pivot to one end of a pipe which passes loosely through the valve, and has a head on its outer end. A toothed segment is suspended within the cylinder and gears into a pinion, through which motion is transmitted to a registering apparatus. When the inlet port is open the water passes alternately into the rear end of the cylinder, and behind the plunger, as the valve is changed by the action of a spring.

MANUFACTURE OF BAR IRON, AND MACHINERY FOR ROLLING THE SAME INTO VARIOUS FORMS.—James Montgomery, New York city.—The material is prepared for drawing down by composing the upper or inner side of the bar of any good quality and any required thickness of homogeneous iron, to give strength and to admit punching of the nail holes of horseshoes. For the lower or entire portion of the bar a hard quality of iron is used, to render horseshoes more durable. This quality of iron is produced by arresting the process of puddling at that stage which leaves the product of a hard, granular character. A bar of this hard iron and one of tough quality are piled together, heated and welded by rolling. These bars are then drawn out and formed into blanks for horseshoes by suitable machinery. Faggots for axles are formed by placing in contact the ends of bars of iron and steel, around mandrels, and supporting their central portions at some distance asunder by means of I-shaped bars. One end may then be heated and rolled, or both ends may be heated simultaneously and completed in a single rolling. The rolling mill has an engine at each end, with a fly wheel having a hollow shaft through which air is forced to keep the journals cool, and otherwise of peculiar construction. Rotation is imparted to the rolls from the fly-wheel shafts by belts and pulleys, one of which is fixed to the fly-wheel shaft, and the other to one of the rolls. The rolls are geared together as usual. At each end of the mill a driving belt passes loosely around the pulleys, and only communicates motion when tightened by a steam piston tightening device. One engine may be employed to drive the rolls one way, and the other to give them reverse motion. The dies employed are removable and adjustable so that they may be made of any suitable shape to point or head spikes, etc., and so that they may be readily reshaped and repaired. Suitably formed dies produce railway or other spikes at one operation.

FAN BLOWER.—Patrick Clark and J. R. Shotwell, Rahway, N. J.—This invention is fully described and illustrated in another column of this issue.

JOINT FOR RAILROAD RAIL.—Joseph Adams, Fairhaven, Vt.—In the neck of the ordinary T-rail a tongued or grooved joint is formed, and this joint extends extends entirely through the neck. A stay of any desired length is made to fit into the neck of the rail, and a supplementary rail is added to the other side, the lower portion of which fits into the neck of the rail like the former, but its upper portion extends up and around the outside of the rail, and its upper edge is sufficiently elevated, to take the tread of the wheels of the locomotive, cars, or trucks so that the ends of the rails will be, in a measure, relieved from pressure, and the wear and disagreeable jolt occasioned by the striking of the ends of the wheels against the the ends of the rails will be avoided. The stay and the short rail are firmly bolted to the rail by bolts which pass through slots so as to allow for the expansion and contraction of the rail.

ESCAPE VALVE FOR STEAM BOILERS.—Jas. C. Cochrane, Rochester, N. Y.—This invention consists of a hollow metal cylinder, with a valve seat in the head thereof, communicating with a tube extending to the bottom of the boiler. A valve is placed in this cylinder, and consists of a metal spindle and piston—preferably made hollow—and on the spindle above the piston is a projecting bulb or cone. The lower end of the spindle is made to fit easily into the tube, so as not to prevent the flow of water or steam. When the cylinder extends above the boiler, a cap is placed over it and firmly fixed to the head of the boiler. In the top of this cap is an aperture to match the bulb of the spindle, so that when the piston is pressed up, the bulb will enter and fill the aperture, and the valve is then closed. The head of the cylinder is made tight with packing, so that no steam can pass except through the tube. The lower part of this tube is made funnel-shaped, and pierced with holes up to low-water mark. This tube may be made shorter so as only to reach down to low-water mark, and then no holes would be pierced in the sides of the tube. When the water in the boiler is above low-water mark the pressure of the steam will cause the water to rise into the valve chamber and close the valve, and *vice versa*. A whistle may be used if desired.

LEVER ESCAPEMENT FOR WATCHES.—Julius Hietel, John W. Hietel, and John L. Geissler, Philadelphia, Pa.—This invention consists in constructing the lever of a watch escapment of two arms, which are connected at their outer ends by a spring, and fitting it around the staff, which has a groove formed in it for the reception of the short arm. The application and arrangement of this self-regulating spring lever will, when the watch is shaken, allow the ruby pin to pass, and will therefore permit the balance to turn freely under the influence of such shock or motion so as to prevent the breaking of the ruby pin or pivots, frequent in ordinary lever escape ments, and at the same time it avoids the complication of the chronometer escapement.

PUDDLING IRON.—Charles Hewitt, Trenton, N. J., assignor to A. S. Hewitt, New York city.—This process consists in mixing cast iron divided into coarse granules, varying from one fifth of an inch in bulk, with oxide of iron, then melting, stirring, and boiling them together. The process is completed by boiling the iron, thus obtained in a puddling furnace.

LIQUID METER.—James P. Smith, Cleveland, Ohio.—This invention consists in the combination of a conical and needle valve, and their adaptation to the ingress and egress pipes of a liquid meter. The liquid enters the body of the meter through a pipe projecting into the body of the meter, larger than the egress pipe, so that the body of the meter is kept full of liquid under pressure. A cone is placed in the inner end of the ingress pipe, the stem of which passes through guides to secure vertical motion. To this valve is attached an arm carrying a needle valve, slightly tapered, which enters a small pipe, so that however much or little the inner end of the ingress pipe may be opened by the inward pressure of the water, the mouth of the small pipe will be opened in exactly the same ratio; and the amount of water entering the ingress pipe is exactly proportional to the amount escaping from the mouth of the small pipe. By measuring the latter, the amount discharged by the former is determined.

REVERSIBLE PARASOL.—Joseph E. Banks, New York city.—This invention consists in so arranging the ribs, stretchers, and cover of a parasol that when spread the ribs will project at right angles from the stalk, forming a flat top with central conical extension above or below the flat part. The stretchers and ribs are connected with two runners, by either of which the frame may be spread, one being connected to the stalk near the top, and the other below. The lower one is most convenient for this purpose, the upper one being fixed by a spring or other device. The frame, or parachute may be closed by moving the runners in either direction on the stalk. The spring catches are arranged to facilitate the movements of the runners over them in either direction. The frame, with its runners, is reversible, so that the central conical projection of the cover which was upwards will be downwards when the parasol is opened.

DRILLING APPARATUS.—Samuel Lewis and William McFarland, Brooklyn, N. Y.—This invention is fully described and illustrated on page 385, Vol. XX., of the SCIENTIFIC AMERICAN.

ACTUATING SHIPS' PUMPS.—Almon Koff, Southport, Conn.—This invention was fully described and illustrated on page 20, Vol. XXI., of the SCIENTIFIC AMERICAN.

GUN LOCKS.—Randal D. Hay and James M. Hill, Crooked Creek, N. C.—A hollow case or guard is hinged to the side of the lock, so that when closed up against the side of the lock, the top will project over the nipple. This guard is moved out of the way of the hammer, in discharging the gun, by a lever, bell-crank, and link, actuated by the trigger, so as to throw the guard out of the way of the trigger. Springs throw the guard back again after the hammer is raised, and the gun is thus prevented from being accidentally discharged.

FRICTION MATCHES, AND MATCH BOXES FOR HOLDING THE SAME.—Wm. H. Rogers, New York city.—These matches are made by combining any of the ordinary friction match compositions with gutta percha, or caoutchouc, which makes a flexible match cord. The second part of the invention is a metallic case like a pencil case, to contain the flexible match, out of which it is slid as wanted. This case is also provided with a cap to extinguish the match, when it is no longer wished to keep it ignited.

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Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING March 8, 1870.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
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For copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
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100,487.—BARBER'S CHAIR.—Anthony Abel (assignor to himself and Adam Schwab), New York city.

100,488.—TIRE-UPSETTING MACHINE.—P. J. Ayres, Lydon, N. Y.

100,489.—FAUCET.—F. M. Bachman and Samuel Ricker, Fredericksburg, Pa.

100,490.—BOOT-LASTER.—Lewis Barnett (assignor to himself and J. D. Boal), Leechburg, Pa.

100,491.—BED BOTTOM.—Wm. Bowen, Dayton, Mich. Antedated March 1, 1870.

100,492.—COFFEE-CLEANING MACHINE.—J. W. Brady (assignor to M. W. Brady), Catonsville, Md.

100,493.—COFFEE-CLEANING MACHINE.—J. W. Brady (assignor to M. W. Brady), Baltimore, Md.

100,494.—PRINTING PRESS.—James M. Brownson, Brooklyn, N. Y.

100,495.—CORN PLANTER.—S. B. Buck, Elyria, Ohio.

100,496.—FRUIT JAR.—Ira Buckman, Jr., Williamsburgh, N. Y.

100,497.—DESULPHURIZING ORES.—Elizabeth A. Burns, Meadow Lake, Cal.

100,498.—CRIMPING MACHINE.—Wm. Butterfield (assignor to himself and T. E. Roberts), Boston, Mass.

100,499.—CULTIVATOR.—Horace Carr, Wooster, Ohio.

100,500.—CULTIVATOR.—Horace Carr, Wooster, Ohio.

100,501.—CULTIVATOR.—Horace Carr, Wooster, Ohio.

100,502.—MORTISING MACHINE.—F. G. Chapman, Chicago, Ill.

100,503.—MACHINE FOR POLISHING WOOD.—F. G. Chapman (assignor to Dennis Beach), Chicago, Ill.

100,504.—BRACELET.—D. D. Codding, North Attleborough, Mass.

100,505.—SASH BOLT.—J. C. Cooke, Bridgeport, assignor to De Witt C. Sage, Middletown, Conn.

100,506.—PAPER CUTTING MACHINE.—A. W. Currier, Grand Rapids, Mich.

100,507.—SLATE FRAME.—Charles B. Dickinson, New York city.

100,508.—SCHOOL DESK AND SEAT.—J. D. Diffenderfer, Lewisburg, Pa.

100,509.—STOP FOR BILLIARD WIRES.—E. O. Dow, Chicago, Ill.

100,510.—RATCHET AND PAWL.—J. H. Durran, Aurora, Ill., assignor to himself and Wm. Lombard, Brooklyn, N. Y. Antedated Feb. 26, 1870.

100,511.—WATCH REGULATOR.—Julius Elson, Boston, Mass.

100,512.—STEAM AND WATER SEPARATOR FOR STEAM ENGINES.—C. E. Emery, Brooklyn, N. Y. Antedated Feb. 18, 1870.

100,513.—WASHING MACHINE.—F. M. English, Evansville, Ind.

100,514.—GUN CARRIAGE.—John Ericsson, New York city.

100,515.—RAILWAY CAR COUPLING.—W. J. Evans (assignor to himself and Charles Warner), Homer, Iowa.

100,516.—MEDICAL COMPOUND OR OINTMENT.—G. D. Field, New Orleans, La.

100,517.—WINE AND CIDER MILLS.—W. K. Foltz and W. A. McCool, Ashland, Ohio.

100,518.—HORSE HAY FORK.—R. S. Frame, Washington, Ohio. Antedated Dec. 31, 1869.

100,519.—HIDE MILL.—J. P. Friend, Peabody, and B. R. Annable, Salem, Mass.

100,520.—TANNING.—A. D. Fullmer, Buffalo, N. Y.

100,521.—DIE FOR FORMING SHOVELS.—H. O. Ganyard (assignor to Ami Hills), Rochester, N. Y.

100,522.—HANDLE OF FOLDING UMBRELLA.—Louis Gehlen, New York city.

100,523.—PROCESS OF PULPING AND BLEACHING PAPER STOCK.—J. W. Goodwin, Petersburg, Va. Antedated Feb. 26, 1870.

100,524.—BEEHIVE.—Henry Grems, Westmoreland, N. Y.

100,525.—SADIRON HEATER.—Gordon O. Honks, Addison, Vt.

100,526.—COTTON SEED PLANTER AND FERTILIZER DISTRIBUTER.—H. C. Harris, Fort Valley, Ga.

100,527.—ICE CHAMBER FOR REFRIGERATOR.—J. W. Hazlett, New York city.

100,528.—EVAPORATING SALT BRINES AND OTHER LIQUIDS.—Jacob Heim, New York city.

100,529.—STUMP EXTRACTOR.—Johnson Higgins, Friendship, N. Y.

100,530.—FLUE FOR DRY-HOUSE.—W. B. Hix, Rome, Ga. Antedated March 2, 1870.

100,531.—STEAM GENERATOR.—G. P. Hunt, United States Navy.

100,532.—GRAIN AND STRAW-CARRYING ATTACHMENT FOR SEPARATORS.—Byron Jackson and B. F. Jackson, Woodland, Cal.

100,533.—LAMP SHADE.—W. H. Johnson, Springfield, Mass.

100,534.—CARBURETING AIR.—Charles Lawrence, Cincinnati, Ohio.

100,535.—CORRUGATIONS OF BOOT AND SHOE UPPERS.—Wm. Lee, New Haven, Conn. Antedated Feb. 26, 1870.

100,536.—STOVE GRATE.—Erastus C. Loud, Springfield, Mass.

100,537.—MILLSTONE DRESS.—G. W. Loy, Nacogdoches, Texas.

100,538.—WIND-WHEEL.—Charles Mahler, San Francisco, Cal.

100,539.—BASE BURNING FIREPLACE HEATER.—John Martino, Philadelphia, Pa.

100,540.—COMPOUND FOR THE MANUFACTURE OF WAX FLOWERS.—Mary Jane McColl, Chicago, Ill.

100,541.—BEVEL-JAWED VISE.—Austin Z. Mason (assignor to R. B. Robins), Adrian, Mich.

100,542.—INSTRUMENT FOR COUPLING RAILWAY CARS.—Abner McOmber and Mina Ward, Schenectady, N. Y.

100,543.—RAILROAD CAR HEATER.—William Meller (assignor to himself and Joseph Sutton), McKeesport, Pa.

100,544.—COFFEEPOT.—Sante Mento, Alliance, Ohio.

100,545.—MEAT-POUNDER BLOCK AND CHOPPING BOWL.—G. B. Mill, Buffalo, N. Y.

100,546.—PRESS FOR HAY, COTTON, ETC.—Samuel Miller, Mount Union, Pa.

100,547.—REVOLVING HARROW.—H. H. Monroe, Thomaston, Me.

100,548.—PREPARING BUTTON-HOLE TWIST.—Robert Morrison, Yonkers, N. Y.

100,549.—LIGHTNING ROD.—David Munson, Indianapolis, Ind.

100,550.—DAMPER ACTION FOR UPRIGHT PIANO-FORTES.—G. W. Neill (assignor to Chickering & Sons), Boston, Mass.

100,551.—SCROLL SAW.—Governeur M. Nickason, Ellenville, N. Y.

100,552.—FANNING MILL AND GRAIN SEPARATOR.—Harrison Ogborn, Richmond, Ind.

100,553.—Purifying Acetic Acid.—T. L. Olden, Brooklyn, N. Y.

100,554.—Wood Pavement.—A. Warner Platt, New York city.

100,555.—Grain Drill.—Hiram Pulse, Waldron, Ind.

100,556.—Lock.—Daniel B. Read and J. H. Clapp, Providence, R. I., assignors, by mesne assignments, to C. C. Dickerman, Boston. Mass.

100,557.—Stove-Pipe Drum.—Edmund D. Roberts, Hartford, Conn.

100,558.—Window-Shade Holder.—E. J. Robinson, Syracuse, N. Y.

100,559.—Gasometer.—Thomas F. Rowland. Green Point, N. Y.

100,560.—Sled Brake.—G. W. Sanborn (assignor to J. W. Sanborn), Gilmanton, N. H.

100,561.—Self-Closing Faucet.—Carl Schultz and Thomas Warker, New York city. Antedated February 21, 1870.

100,562.—Calkers' Mallet.—Samuel C. Searles, Wilmington, Del.

100,563.—Felted Fabric.—S. P. Siver, Danbury, Conn.

100,564.—Toy Money Box.—F. W. Smith., Jr., Bridgeport, Conn.

100,565.—Riding Saddle.—Eugene Spedden, Astoria, Oregon.

100,566.—Furnace for Smelting, and for other Purposes.—John Thomas (assignor to himself, William Bacon, Harrison Groves, and Hugh Chaytor), Middlesbrough, Eng. Patented in England, July 18, 1868.

100,567.—Balanced Water Elevator.—W. L. Thomas, Wadsworth, Ohio.

100,568.—Seal Lock.—Gustave Ulman (assignors to C. R. Goodwin), Ivry-sur-Seine, near Paris, France.

100,569.—Bed Bottom.—W. W. Wait, Richmond, Ind.

100,570.—Machine for Making Horse Shoes.—Edwin Wassell, Wood's Run, Pa.

100,571.—Stove Shelf and Dryer.—J. J. Watson (assignor to himself and Hiram Watson), Coatsville, Pa. Antedated March 1, 1870.

100,572.—Vapor Burner.—Henry Wellington (assignor to himself and T. P. Doane), Chicago, Ill.

100,573.—Fertilizer Sower.—T. J. West (assignor to himself, J. L. Russell, and A. C. Frisby), Alfred Center, and Joel Morekees, Andover, N. Y.

100,574.—Machine for Making Horse Shoes.—Chas. W. Wettengel, Pittsburgh, Pa.

100,575.—Loom Cam.—George O. Wickers, Lawrence, 'and Thomas J. McClary, North Andover, Mass.

100,576.—Steam Pump Device.—Martin Wilcox, Sacramento, Cal. Antedated December 30, 1869.

100,577.—Sash Holder.—James Wilkinson, Albany, N. Y.

100,578.—Lantern.—Arnold Withmar, St. Louis, Mo.

100,579.—Method of Laying off Patterns for Stitching on Leather.—William P. Wolfington. Louisville, Ky.

101,580.—Inlaying Metallic Surfaces.—E. G. Wright, Boston, Mass.

100,581.—Bolt Machine.—John R. Abbe, Providence, R. I. Antedated March, 1, 1870.

100,582.—Umbrella.—Edward Adams, Boston, Mass.

100,583.—Vegetable and Fruit Peeler.—E. D. Averell and Joseph Malan, Brooklyn, N. Y.

100,584.—Carriage Wheel.—James R. Baird, Vincennes, Ind.

100,585.—Expansible Cores for Casting Iron, Glass, etc.—Anson Balding, Wheeling, West Va.

100,586.—Mustache Guard for Drinking Vessels.—E. W. H. Bass, Quincy, Mass.

100,587.—Compound to be Used as an Article of Diet.—C. G. Baylor, Quincy, assignor to E. S. Tobey, Richard Soule, and Chas. Soule, Boston, and Louisa D. Baylor, Quincy. Mass.

100,588.—Paint Compound.—Ezra Blakeley (assignor for one half to Peter Pierson), Neponset, Ill.

100,589.—Railroad-Car Ventilator.—Isaac Bonnell, Jr. (assignor to himself and H. G. Lambard), Chicago, Ill.

100,590.—Brick Machine.—G. C. Bovey, Cincinnati, Ohio.

100,591.—Water-Proof Fabric.—Thomas Bracher, Rahway, N. J. Antedated February 26, 1870.

100,592.—Reducing Gear for Steam Engine Indicators.—H. L. Brevort, Brooklyn, N. Y.

100,593.—Blind.—W. E. Brock, New York city.

100,594.—Adjustable Windlass.—John S. Brown, Schenectady, N. Y.

100,595.—Pump.—James Byran, New York city.

100,596.—Let-Off and Tension Device for Spools of Braiding Machines.—James D. Butler, Lancaster, Mass. Antedated February 26, 1870.

100,597.—Ditching Machine.—James Calliham (assignor to David M. Calliham), Baton Rouge, La.

100,598.—Printing Press.—Adam Campbell, Brooklyn, N. Y.

100,599.—Animal Trap.—Henry C. Case, Pekin, Ill.

100,600.—School Desk and Seat.—Wesley Chase, Buffalo, N. Y.

100,601.—Laundry Indicator.—Robert Clarke, Macon, Ga.

100,602.—Wrench.—A. G. Coes, Worcester, Mass.

100,603.—Hand Rubber for Washing Clothes.—G. F. J. Colburn, Newark, N. J.

100,604.—Machine for Picking Curled Hair.—N. L. Cole, (assignor to himself and A. N. Upham), Norwich, Conn.

100,605.—Brad Setter.—M. D. Converse, London, Ohio.

100,606.—Floating Ship.—G. W. Corey and T. Losie, New York city. Antedated Feb. 28, 1870.

100,607.—Press.—Dexter Curtis, Madison, Wis. Antedated Feb. 26, 1870.

100,608.—Composition for Preserving Timber and Wood.—Edward J. De Smedt (assignor to N.Y. Improved Anthracite Coal Co.) New York city.

100,609.—Well Borer.—S. H. Dickerson, Hudson, Mich.

100,610.—Machine for Making Sash.—S. C. Ellis, Jersey City, N.J.

100,611.—Combined Hay Knife and Pruning Hook.—D. Fasig, Rowsbury, Ohio.

100,612.—Balance Slide Valve.—James Fitzgerald, Brooklyn, N. Y.

100,613.—Pole Ascending Apparatus.—George Fleming, New York city.

100,614.—Cord Holder for Windows, etc.—G. S. Gladding, Chester, Conn.

100,615.—Harvester Rake.—William F. Goulding, Providence, R. I.

100,616.—Door Retainer.—Charles T. Gravatt, Philadelphia, Pa.

100,617.—Machine for Refitting Conical Valves.—C. F. Hall, Brooklyn, N. Y.

100,618.—Elastic Protector for Horses' Feet.—W. H. Hall, Boston, assignor to himself and Joseph W. Haskins, Charlestown, Mass.

100,619.—Variable Cut-off Valve Gear.—Wm. Harsen, Green Point, N. Y.

100,620.—Farm Gate.—Calvin Hart, Farmington, Ill.

100,621.—Paper-box Machine.—C. B. Hatfield, Philadelphia, Pa., assignor to himself, Horace B. Hellman, Joseph Willcox, and H. B. Willcox.

100,622.—Self-waiting Table.—W. W. Hawley, Mount Morris N. Y.

100,623.—Water Gate.—Marshal Hays, Fostoria, Ohio.

100,624.—Plow.—Daniel Heiges, Cashtown, Pa.

100,625.—Slide Valve.—Abraham Hemingway, New York city.

100,626.—Carriage Spring.—Benj. T. Henry, New Haven, Conn.

100,627.—Bobbin for Sewing Machines.—J. B. Herreshoff, Bristol, assignor to G. A. Williamson and Samuel T. Shattuck, Providence, R. I.

100,628.—Aspirator for Preventing Overheating of Grain, etc.—T. A. Hoffman, Beardstown. Ill.

100,629.—Treating Blood for the Preparation of Fertilizers, and for Other Purposes.—H. A. Hogel, New York city, assignor to himself and C. G. Bruce.

100,630.—Machine for Punching the Leaves of Elliptic Springs.—George Hopson, Bridgeport, Conn.

100,631.—Hollow Grate for Steam Boiler.—C. E. Hutson, Commerce, Mo.

100,632.—Heat-resisting Materials for Safes, Bank Vaults, etc.—Theo. Hyatt, New York city.

100,633.—Device for Packing and Transporting Eggs.—Benj. Illingworth, Freeport, Ill.

100,634.—Check for Gas Burners.—J. H. Jennings, New Bedford, Mass.

100,635.—Spring Bed Bottom.—T. W. Johnston, Richmond, Me.

100,636.—Furnace for Drying Sand.—I. D. Johnson and A. V. Hartwell, Chicago, Ill.

100,637.—Lamp Chimney.—Edward Jones, South Boston, Mass.

100,638.—Tablet, Token, or Check, to be Used in Life Insurance.—H. A. Jones, Brooklyn, N. Y.

100,639.—Peanut Cleaning and Polishing Machine.—J. M. Keating, Norfolk, Va.

100,640.—Mucilage Holder.—James M. Keep, New York city.

100,641.—Stovepipe Damper.—William J. Keep, Troy, N. Y.

100,642.—Clamp.—G. D. Lambert, New Haven, Conn.

100,643.—Motive Power for Carriages.—S. L. Langdon, New Orleans, La.

100,644.—Padlock.—T. Lanston, Washington, D. C.

100,645.—Fluting Machine.—T. Leavitt and E. L. Howard, Malden, Mass.

100,646.—Carriage Axle.—W. A. Lewis, Joliet, Ill.

100,647.—Treating Liquor Containing Gelatin or Glue.—Orazio Lugo, Baltimore, Md.

100,648.—Water Wheel.—Samuel Martin, York, assignor himself and B. F. Manifold, Lower Chanceford, Pa.

100,649.—Flatiron Polisher and Holder.—W. B. Mason, Boston, Mass.

100,650.—Horse Hay Fork.—J. M. McDonald, McCoysville, Pa.

100,651.—Safety Mechanism for Hoisting Apparatus.—W. H. Merrick, Philadelphia, Pa.

100,652.—Compound for Stuffing Leather.—J. Merrill, Boston, Mass.

100,653.—Lamp Burner.—Rufus Spaulding Merrill, Cambridge, assignor to himself, William B. Merrill, and Joshua Merrill, Boston, Mass.

100,654.—Machine for Turning Balls or Mandrels.—William Newsham (assignor to Morris, Tasker & Co.), Philadelphia, Pa.

100,655.—Cultivator.—Walter Notman, Deerfield, Ohio.

100,656.—Card Rack.—Leverett H. Olmsted, Brooklyn, N. Y.

100,657.—Dish Washer.—Merrill S. Orton and P. B. Stiles, Galesburg, Ill.

100,658.—Paper Box.—Bennett Osborn, New York city.

100,659.—Emery Wheel.—J. L. Otis, Leeds, Mass.

100,660.—Sawing Machine.—Andrew G. Park, Leon, N. Y.

100,661.—Combined Latch and Lock.—Frank P. Pfleghar (assignor to himself and McLagon & Stevens) Hew Haven, Conn.

100,662.—Clothes Dryer.—Russell Phillips, Boston, Mass.

100,663.—Mode of Suspending Mirrors to Furniture.—Levi Pierce, Charlestown, Mass.

100,664.—Ditching Machine.—Willard Pierce, Truxton, N. Y.

100,665.—Union Coupling for Pipes.—R. M. Potter, Jersey City, N. J.

100,666.—Telegraph Pole.—E. Freeman Prentiss, Philadelphia, Pa.

100,667.—Potato Digger.—Wm. R. Prince, Parkersburg, West Va.

100,668.—Manufacture of Illuminating Gas.—A. C. Rand (assignor to William J. Nichols, Alden B. Rand, and Richard H. Brown), New York city.

100,669.—Reversible Shirt.—Charles O. Richter, New York city.

100,670.—Dye Vat.—T. E. Rogers, Dexter, Me.

100,671.—Lubricating the Traversing Guide in Machines for Feeding Carding Engines.—Bozil S. Roy, Olneyville, R. I.

100,672.—Mortising Machine.—Anton Schmackers, Cincinnati, Ohio, assignor to Lane & Bodley.

100,673.—Water-Current Motor.—J. Q. A. Schoonover (assignor for one half to J. S. Totten), Lebanon, Ohio.

100,674.—Stump Extractor.—Henry Schwartz, Fayetteville, Ohio.

100,675.—Stop Motion for Spooling Machines.—Samuel Semple, Jr., Mount Holly, N. J.

100,676.—Fruit Transportation Box.—Walter Shaw (assignor to himself, Jonathan Vincent, and Seldon R. Redman), Newfane, N. Y.

100,677.—Heel of Rubber Boots and Shoes.—F. M. Shepard, New York city.

100,678.—Sole of Rubber Boots and Shoes.—F. M. Shepard, New York city.

100,679.—Wood-Splitting Machine.—R. D. Silverwood (assignor to Wm. Silverwood), Baltimore, Md.

100,680.—Spoon Holder and Bell.—Samuel Simpson Wallingford, Conn.

100,681.—Apparatus for Refrigerating and Preserving.—D. E. Somes, Washington, D. C.

100,682.—Cooling and Preserving Tank.—D. E. Somes, Washington, D. C.

100,683.—Apparatus for Cooling and Preserving.—D. E. Somes, Washington, D.C.

100,684.—Gas Machine.—Theodor G. Springer, St. Louis, Mo.

100,685.—Machine for Bending Fellies.—D. A. Sprinkle, Leoti, Ind.

100,686.—Tool for Lacing Belts.—J. M. Stamp (assignor to himself and Peter Johnston), Grass Valley, Cal.

100,687.—Hay and Cotton Press.—George W. Swift, Memphis, Tenn., assignor to himself and E. G. Graham, De Soto county, Miss.

100,688.—Roofing Compound.—F. C. Tegetthoff, Cleveland, Ohio.

100,689.—Manufacture of Ice and Cooling Air, Liquids, etc.—Charles Tellier, Paris, France, assignor to Leopold Bouvier, New York city.

100,690.—Grooving Chisel.—H. G. Terwilliger, Scranton, Pa. Antedated February 28, 1870.

100,691.—Sun Dial.—L. I. Trueg, St. Vincents, Pa.

100,692.—Damper.—J. P. Tuttle, Warren, Ohio.

100,693.—Railway Rail Splice.—Jacob Valentine, Bound Brook, Francis Harris, Jr., Elizabethtown, N. J., and C. Barnes, New York city, assignors to D. R. Pratt, New York city.

100,694.—Sash Holder.—A. Van Patten and J. F. Kelsey, Weyauwega, Wis.

100,695.—Planing Machine.—Loudus B. Walker, Chicago, Ill.

100,696.—Plow.—L. T. Webster, Northfield, Mass.

100,697.—Self-Closing Auger Stop Cocks.—Alfred Weed, Boston, Mass. Antedated Feb. 25, 1870.

100,698.—Spring Bed Bottom.—William Wells, Salem, Mass.

100,699.—Construction of Stove Plates.—August Wernet and John Kershaw, Canton, Ohio.

100,700.—Floor Clamp.—George Wood, Philadelphia, Pa.

100,701.—Collar and Hames.—J. L. Wooden, Greensburg, Ind.

100,702.—Pump.—Wm. Wright, New York city.

100,703.—Muff and Collar Box.—Henry Fowler, Detroit, Mich., assignor to Jason Crane, Bloomfield, N. Y.

100,704.—Dovetailing Machine.—Henry H. Bashore, Philadelphia, Pa.

100,705.—Construction of Chimneys and Flues.—Joseph Kleckner, Mottville, Mich.

100,706.—Cement to be Used in Sewers and Drains, and for Constructing Flues and other Parts of Buildings.—J. Kleckner, Mottville, Mich.

100,707.—Railway Switch.—Joseph J. Shaeffer and Curtis C. Steinmetz, Middletown, Pa.

REISSUES.

3,869.—Watchman's Time Detector.—Jacob E. Buerk, Boston. Mass., assignee of John Burk.—Patent No. 31,032, dated January 1, 1861; patented in France, Oct. 29, 1856; reissue 2,054, dated August 22, 1865.

3,870.—Tumbler Washer.—G. D. Dows and Calvin Dows, Boston, and G. S. Cushing, Lowell, Mass., assignees, by mesne assignments, of Albert Hallowell.—Patent No. 22,363, dated February 18, 1866.

3,871.—Packing Case for Tobacco.—S. F. Hess, Rochester, N. Y.—Patent No. 99,188, dated January 25, 1870.

3,872.—Apparatus for the Manufacture of Gas.—W. J. Nichols and A. C. Rand (assignees, by mesne assignments, of L. D. Gale, assignors to W. J. Nichols, A. B. Rand and R. H. Brown), New York city.—Patent No. 26,028, dated November 8, 1859.

3,873.—Manufacture of Gas.—W. S. Nichols and Alonzo C. Rand (assignees, by mesne assignments, of L. D. Gale, assignors to W. J. Nichols, A. B. Rand, and R. H. Brown), New York city.—Patent No. 26,030, dated November 8, 1859.

3,874.—Corn Stalk Cutter.—G. W. Cole, Farmington, Ill.—Patent No. 39,214, dated July 14, 1863.

3,875.—Water Wheel.—William Foos, John W. Bookwalter, Mary A. Leffel, Springfield, Ohio, and Lamar Foos, New Haven, Conn., assignees, by mesne assignments, of D. K. Kraatz.—Patent No. 20,921, dated July 13, 1858.

3,876.—Horse Hay Fork.—J. K. O'Neil, Kingston, N. Y.—Patent No. 55,528, dated June 12, 1866.

3,877.—Lime Kiln.—C. D. Page, Rochester, N. Y.—Patent No. 22,299, dated December 7, 1858.

DESIGNS.

3,881 and 3,882.—"Bedouin" or "Arab."—Thomas Dolan, Philadelphia, Pa. Two Patents.

3,883 and 3,884.—Tack Head.—George A. Field (assignor to the Albert Field Tack Company), Taunton, Mass. Two Patents.

3,885.—Top Plate, Barrel Bridge, and Cock for Watches.—Fayette S. Giles (assignor to Giles, Wales & Co.), New York city.

3,886.—Barred Bridge, Ratchet-Cap Base, and Arbor Cup of Watches.—F. S. Giles (assignor to Giles, Wales & Company), New York city.

3,887.—Trade Mark.—O. C. Maxwell, T. L. Neal, and C. L. Long, Dayton, Ohio.

3,888.—Clock Front.—Nicholas Muller, New York city.

3,889.—Trade Mark.—George C. Thilenius, Cape Girardeau, Mo.

3,890.—Tea Set.—H. Vasseur (assignor to Simpson, Hall, Miller & Co.), Wallingford, Conn.

3,891.—Ice Pitcher.—H. Vasseur (assignor to Simpson, Hall, Miller & Co.), Wallingford, Conn.

3,892.—Carpet Pattern.—Hugh Christie, Morrisania, N. Y.

3,893.—Spice Mill.—Wm. Haslam (assignor to Henry Troemner), Philadelphia, Pa.

3,894.—Collar Box.—John R. Jerauld and Henry L. Holmes, Providence, R. I.

EXTENSIONS.

Ore Washer.—W. L. Carter, of Marietta, Pa.—Letters Patent No. 14,388, dated March 11, 1856.

[Communicated].

ROTATING AND FIXED TURRETS.

To the Editor of the New York Times:

Please publish the following communication, which has been declined by the editors of the *Army and Navy Journal*, to whom it is addressed.

JAMES B. EADS.

St. Louis, January 29, 1870.

Editor of the Army and Navy Journal:

Sir:—Your editorial contributor of the article published in your journal on the 1st of January, and entitled "Rotating and Fixed Turrets," seems to know that the defects of the monitors are becoming so well understood that their claim to be considered *invulnerable* cannot be supported either by their record or by the intrinsic merits of their design. He evidently thinks but one way is left to save the system from public disfavor and that is by clamoring about the ignorance of those who have the temerity to doubt its superiority over every other.

Your contributor makes no denial of the justice of my criticisms when applied to the monitors provided with *base rings*, supported as they were by proofs from official reports; but admits that "the original small craft which served us so effectually during the war, possessed defects, which in later structures have been nearly overcome, and which in future structures may be wholly removed." He says, "these cardinal objections urged on Mr. Eads' system of naval defense, are wholly groundless as regards the *Dictator*. It was not this vessel, it appears, but the original batch of small monitors, which Mr. Eads criticised," and tells us "that these objections have been removed in the *Dictator* and *Puritan* classes, and consequently in the *Kalamazoo* class of turrets." He says: "The *base ring* which was attached to the small monitors because the thin turret plating was found inadequate, a matter to which Mr. Eads devotes much space, we deem it waste of time to discuss. All that need be said is that the *Dictator* and *Kalamazoo* class of turrets *were built* (these *italics* are mine) on a plan requiring no ring at the base."

From these extracts it is evident he abandons the attempt to defend the vessels provided with *base rings*. These constitute the *Monadnock*, *Canonicus*, *Passaic*, and *Yasoo* classes, nearly forty monitors, all of which he leaves *hors du combat*, and concentrates his entire energies in defending the monitor system with the turrets of the *Dictator* class, the *Puritan* class and the *Kalamazoo* class. I therefore leave "the original batch" to survey the field occupied by these invincibles. How many remain, then, of these undemolished and acknowledged representatives of the monitor system? Will your readers, after all this ado about how our *Kalamazoo* class of turrets "*were built*," and all the bombast about the *Puritan* class, and the *Dictator* class, credit the fact that excepting the *Dictator*, there is not at this time, and never has been, a turreted vessel of either class in existence?

I once read of an urchin at school (not "one of our young friends at West Point and the Naval Academy"), who, having his coat closely buttoned up, was asked, "Where is your shirt?" "Mother is washing it." "Have you but one shirt?" continued the astonished interrogator. To which the indignant lad replied, "Would you expect a body to have *a thousand* shirts?" When your contributor is asked, "Have you but one of these wonderful vessels?" I can imagine his indignation as he replies, "Would you expect a body to have *a thousand Kalamazoos?*"

I shall not quarrel, however, with him because of the paucity of his *Kalamazoos*, but will briefly proceed to examine the merits of his last remaining hope—the *Dictator*. I will first state, however, that the turrets of the *Puritan* and the *Kalamazoo* classes, which he takes so much pains to tell us, "*are composed* (my italics again) of two distinct cylinders of plate iron," have never been constructed at all.

The Department is even now maturing plans for completing as casemated ships the vessels constituting these classes which were commenced several years ago, and before the defects of the *Dictator* were fully manifested. I am informed that it has already decided to do this with the *Kalamazoo* The fact that their turrets were once contracted for, and that the Department compounded with the contractors and canceled the agreements while the work was in progress, together with its subsequent course in the premises, would seem to prove its want of faith in the system; but this will, doubtless, be all explained by your contributor. The motive which prompted him, however, to endeavor to lead the public to believe these turrets "were built" and "are composed," etc., when they are not yet built, together with certain questions of ethics, to which the use of these deceptive phrases give rise, I leave for him to settle with your readers, while I proceed to examine the merits of the *Dictator*. The impregnability of the joint between the base of the pilot house and the turret roof of the *Dictator* is thus set forth by your contributor: "We stated in our article that shot could not strike the base of the pilot house of the *Dictator* because the turret wall of that vessel (we might have added the turrets of the *Kalamazoo* class) is carried to such a hight that shot cannot thus strike." The top of her turret wall is 26½ feet in diameter. The pilot house placed in the center of it is not over ten feet. This leaves about 8 feet all round from pilot house to turret wall. The turret wall of the *Dictator* is projected only six inches above the turret roof, consequently a roll of the ship of four degrees would bring the top of the turret wall below the level of the base of the pilot house.

This protection would then cease to exist against shot moving in that horizontal plane, and this plane would be no higher than the guns of several English iron-clads already afloat. To make this boasted protection available against them at short range, it would be necessary that the contest be fought on a perfectly smooth sea. Even in such a sea, this six-inch belt would be too low to protect this joint against their guns if they were only a few hundred yards distant, for the elevation of three or four degrees re

quired by the distance would so increase the curvature of the trajectory of the shot as to insure its passing over the turret wall, it being only high enough, when perfectly level, to intercept projectiles intersecting the line of fire at an angle of less than four degrees. In attacking forts it must be manifest that this joint would be exposed to the direct fire of any gun four degrees above it.

Even in a calm sea, a gun on a level with it or even below it, would command this joint, if it were sufficiently distant to require a few degrees of elevation to maintain the trajectory above the line of fire to the requisite distance. It is therefore ridiculous to claim that this joint is impregnable against fortifications. To make it at all available against an enemy afloat involves the necessity of a smooth sea, and of the *Dictator* selecting and maintaining her own position in the fight. As she is known to be a complete failure in point of speed, making only seven knots per hour, of course this would be impossible with almost any English iron-clad afloat, none of which have a speed of less than nine knots, while several go at thirteen or fourteen. It is therefore evident that this six-inch belt projected above the turret roof is too insignificant a defense of the joint to merit serious consideration. My apology for devoting so much space to it is that it is claimed to be so important. If it must continue to form a characteristic feature in the monitor system it is essential for the advocates of the system to insist that the rules of the prize ring be adopted in naval engagements, and that it be expressly understood that hits on the pilot house below the belt shall be unlawful, and will entitle the monitor to claim the stakes.

Your contributor maintains that it is impossible for any heavy projectile to disturb the inertia of the *Dictator's* pilot house, weighing eighty thousand pounds, and held in place by a fourteen-inch spindle. He asserts, therefore, that it would not be bent over, and thereby endanger the rotation of the turret beneath it, nor be liable to be lost overboard by the fracture of the spindle. In support of my assertion to the contrary, made in my report to the Secretary of the Navy, and ridiculed in your contributor's article on the *Moyani Zaffer*, I quoted the report of Captain Drayton, of the *Passaic* (page 61, "Armored Vessels"), and proved by it that a half-spent ricocheting rifle shot (after breaking all of the eleven one-inch plates of the upper part of her turret) had sufficient force left to "mash in the pilot house" and "bend it over."

To avoid the inevitable conclusion that a direct blow from a heavy projectile can *bend over* and disable the forty-tun pilot house on the *Dictator*. If the shot described by Captain Drayton could bend over the twenty-four-tun pilot house of the *Passaic*, similarly secured, this able physicist gravely tells your readers that "The Commander of the *Passaic* had no idea of saying that the *pilot house*, as Mr. Eads appears to suppose, had bent over; the top of the wall had simply bent over by the effect of a glancing shot," and thinks "this singular error of Mr. Eads has probably been noticed by our young friends at West Point and the Naval Academy." Captain Drayton said: "The blow was so severe as to considerably mash in the pilot house, bend it over, open the plates," etc. These young gentlemen will probably think that, as Captain Drayton had already said, the pilot house was considerably "mashed in," it was surplusage to state in the same sentence that "the top of its wall had been bent over" also. Yet this is what your contributor would make them believe he meant to say. It is probable there are not twenty students at the Naval Academy who could not have told this conscientious writer (what he was evidently ignorant of), viz., that the report of the Commission appointed by Mr. Welles to examine and report upon the injuries to the *Passaic*, and published on page 88 of "Armored Vessels," would cover him with confusion for this attempt to distort the plain meaning of a gallant but deceased sailor. For the *words* of Captain Drayton are fully corroborated in that report. This Commission (composed of Captain J. C. Rowan, U. S. N., Charles W. Copeland, George W. Quintard, M. F. Merritt and Jos. J. Comstock) states that the shot in question "raised the pilot house half an inch and *started it over on one side*, breaking two bolts in the pilot house." The italics are my own, the words are those of the report.

Your contributor merits all the glory he has gained by this attempt to destroy the effect of the gallant Drayton's words, in this effort to sustain the ridiculous proposition that the inertia of forty tuns of iron cannot be disturbed by a cannon shot of such weight and velocity as was known to be practicable at the date of the *Dictator's* construction. Arguments, based upon such absurdities, must require unusual expedients to sustain them. If he still doubts that this comparatively light shot did really overcome the inertia of a twenty-four tun pilot house, after being told by one witness that it *bent it over*, and by five others that it *raised it half an inch and started it over on one side*, I can give him other official proof of the power of shot to move monitor pilot houses.

Being engaged from the inception to the close of the rebellion in designing and constructing armored vessels, I was kept promptly and confidentially advised by the Department of "the most important facts" connected with the performance of the monitors and other ironclads; and although charged by your contributor with being ignorant of the subject, may be able to refer him to some other reports that will also be new to him.

Your contributor lays a great stress upon the fact that the gun slides of the *Dictator* do not touch the turret wall, and consequently the disabling of the guns cannot occur from shot striking opposite their ends.

The Commission before referred to, speaking of an accident of this very kind, by which one of the *Passaic's* guns was rendered useless, and certain damages done to the joint at the base of the turret, says: "We would take the liberty of suggesting that this form of injury may hereafter be guarded by fastening a very heavy ring or band around the base of the turret to prevent distortion, and leaving sufficient freedom between the rails of the carriage and the turret, so that any slight distortion of the turret will not effect the gun carriages."

It appears that the suggestion of this intelligent Commission was not deemed large enough for the entire monitor navy, for we find only one half of it used on "the original batch," and the other in the Dictators, Puritans, and Kalamazoos that "were built" on a plan not requiring a base ring. The originals had the ring with the long gun slides, and the last three classes the short gun slides without the rings.

It seems not to have been noticed that one of the chief objects of this practical Commission, in recommending the use of a heavy band around the base of the turret, was to prevent the *distortion*, which those gentlemen foresaw was likely to occur to it if robbed of the eight important points of support in its circumference furnished by the four gun slides, which are placed about four feet apart in the base of the turret, and transversely over the main turret beam through which the vertical spindle passes.

When these should no longer touch the turret wall, it would have nothing except the ends of the main beam, bolted to its base at two opposite points in its circumference, to preserve its circular shape at the deck. These gentlemen doubtless thought that the turret would then be likely to lose the cylindrical, and assume the "partially oval form," if struck by even as small shot as that which mashed in the *Passaic's* pilot house. But they were merely "superficial observers," and had not been taught by your contributor that "a partially oval turret would work upon a broad flat ring as well as one that is cylindrical." They probably thought that a heavy shot at the base might bend the bottom of the wall in without moving the top of it in also, and thus cause an ugly leak, even if it did not stop the turret's rotation, and that its "distortion" might, to some extent, be guarded against by a heavy base ring.

The *Dictator's* turret is 24 feet in its internal diameter. Its wall is 15 inches thick, and it is not enlarged or in any way strengthened at the base.

The turret walls of "the original batch" were eleven inches thick. The bands placed around their bases were five inches thick by twelve or fifteen inches in hight. Including this band, those turrets are consequently one inch thicker at the base than the *Dictator's*.

The *Dictator* has a series of similar five-inch bands, one above the other, incorporated into the construction of her turret, the lower one of them being six inches thick (one of the ten thin plates being cut short to allow for its extra inch of thickness). In my letter I proved from official reports that the base ring about the monitors failed to give adequate protection. The heaviest shot thrown against them were from ten-inch columbiads. These shot weighed only 128 pounds. Yet they were found sufficient to disable a turret sixteen inches at its base, including the base ring. Now is it not a most egregious absurdity to claim that the *Dictator's* turret, not as thick at the base by one inch, is invulnerable against fifteen-inch shot weighing three and one half times as much.

And is it not equally absurd to claim that this wall, resting on a flat, level surface, and in no way secured from being knocked into a "partly oval shape," except at only two points in its entire circumference of 83 feet, should have sufficient stiffness and inertia to prevent its being distorted more than two inches? For two inches is the entire distance existing between the turret wall of the *Dictator* and the ends of her gun-slides. This enormous space of two inches is the basis upon which their claim to impregnability is resting. The feeling of security which possesses your contributor on the gunslide question can only be equaled by the ostrich, who having thrust his head under cover a few inches, thinks everything is then absolutely safe.

Your contributor says: "Critics all point to the disastrous consequences of shot striking at that junction [the base of the turret]; but they do not appear to comprehend the practical merits of the expedient of rotating the turret on a flat ring, level and parallel with the deck." Of course they do not, without a great deal of study, because it is such a very intricate and difficult problem. It might be worked out, though, by the imaginary calculus, if it failed to be solved by the differential or integral. Equally incomprehensible is the proposition, to ordinary minds, that the base of the *Dictator's* turret is safer without a heavy ring to prevent its distortion than with it; and that a fixed turret, joined firmly to the deck "will, owing to the rigid nature of the connection, inevitably produce fracture and leak," from the impact of a heavy projectile, while the same shot would be harmless against the base of the same turret if it was not joined to the deck, but only stood "on a *flat ring*, level with the deck," that would allow the turret to assume the oval or cylindrical form, just as the force of the shot moved it. Neither leak nor harm to the gun slides, two inches distant within it, could possibly occur. "Casual observers" fail to see "the practical merits of the expedient" however, and the records of the "original batch" do not quite support these propositions.

One of the great merits claimed for the *Dictator* is her remarkable steadiness in a seaway. "The sea breaks over their low, flat decks powerless for harm," exclaims their enraptured advocate. He might have added, "and their guns are equally powerless," for the *Dictator's* ports, being but two feet ten inches above her low, flat deck, they must, of course, be kept closed at such times. In consequence of the small exposure of hull above water, a small quantity of armor will clad her sides, and for the same reason a small amount of leakage will send her to the bottom. If we cannot gain immunity from the enemy, who is rarely with us, without increasing the danger of foundering, which is always present, had we not better take our chances behind thinner armor? Perhaps, as suggestive a lesson in the science of naval defense as can be drawn from our late conflict, would be a comparative statement showing the actual loss of life on our armor casemated vessels, caused both by the fire of the enemy and the foundering of the vessels, and the loss of life from the same two causes in the monitors. I am confident that whether this comparison be made according to tunnage, weight of metal thrown in action, cost of the ships, or number of men engaged in them, the loss of life will be found to have been greater on the monitors than on the others; while there is not a sailor afloat or ashore but would deem death in battle far more preferable to the fate of those who went down on the ill-fated *Weehawken*.

The overhang of the *Dictator* is another one of the defects of this vessel, though it has been claimed as one of her greatest perfections.

The amount of impenetrability given by these three or four feet of timber backing projecting out from her sides, is obtained by a sacrifice of speed which makes her terrible ramming projection at the bow a most ridiculous appendage; for the possibility of using it, the vessel never having been able to make over seven knots per hour, is so funny as to "amuse our young friends at West Point and the Naval Academy." This ram, so curiously wrought, and of length sufficient to pierce the most powerful enemy through and through, is only dangerous to the friendly ship that tows her along, as she goes cruising on the high seas, and chasing the enemies of the Republic. A Mormon elder, about to mount a dilapidated steed, was asked what he intended to do with it? On replying that he intended to follow the Lord on him, his interrogator rejoined, "You will have to push that horse right smartly before you overtake him." The *Dictator's* chances for overtaking an enemy are nearly as good. Her contract guaranteed a speed of sixteen statute miles per hour for fifteen consecutive hours, but the greatest speed shown by her steam log, in the Bureau at the Department, is only seven knots, and that but for one brief hour. "*Sic transit*," etc. As the engine and boiler power of this ship is enormous, and as almost every one of the "original batch" (without exception, I believe), failed to make the speed guaranteed by their contracts, I can only account for the fact, in the *Dictator's* case, by the retarding influence of this peculiar appendage, the *overhang*, coupled with the laborious duty of carrying her dangerous ram.

In summing up the wonderful qualities of this perfect specimen of the monitor system, then, we find: First—That her invulnerable turret never has been under fire. Second—That turrets as thick as hers at the base have been injured at the deck joint with projectiles scarcely more than one quarter as heavy as fifteen-inch shot. Third—That her gunslides are only secure against the lighter class of projectiles. Fourth—That similar joints on the turret roof on other vessels have been injured, and the turret stopped by light shot, while hers is only provided with an additional protection that is not available except under the most favorable circumstances, and those circumstances beyond her control. Fifth—That pilot houses similarly secured, and only sixteen tuns less than the weight of hers, have been wrecked by small and half-spent glancing shot. Sixth—That her low speed is such as to make her a helpless hulk against the submerged rams of many war vessels now afloat. Seventh—That her low ports render her unable to return the fire of an enemy, who may chance to overhaul her in a rough sea. Eighth and lastly—That her low position in the water, and the warning fate of three of her predecessors, give assurance that eternal vigilance is the price of her safety against sudden foundering.

To continue thus persistently to mislead our countrymen into the belief that such a vessel is capable of coping with some of the English ironclads now afloat, when we dare not trust her at sea alone for fear of foundering, or that we have one single armored ship (*Kalamazoo* or anything else) that can stand against them, betrays either unpardonable ignorance, or a total want of patriotism.

I have been reluctantly drawn into this discussion to defend myself against the severity of your personal strictures, and have hastily thrown these facts and arguments together with no wish to depreciate the important services rendered by the monitors in our late conflict, nor in any wise to lessen the fame of their distinguished inventor. Their merits and his genius will find in history the high place deservedly won by them in the exigencies of the hour, no matter what system of naval defense be found best suited to the present wants of the age.

I have no leisure to notice the ridicule or criticisms which you or others may choose to apply to *my system*, nor have I the right to ask your space in defense of it, but trust I shall always find time and materials, and have opportunity granted, to repel personal charges of ignorance and misrepresentation, either direct or implied, when made in a journal of respectable standing. Your obedient servant, JAMES B. EADS.

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